ADDENDUM
Tribal Environmental Evaluation
Temporary Construction Staging

Jamul Indian Village
Gaming Development Project

October 2014

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ADDENDUM:
TEMPORARY CONSTRUCTION STAGING
JAMUL TRIBAL ENVIRONMENTAL EVALUATION

SUMMARY

The Jamul Indian Village (hereafter, "Tribe") has proposed this Third Addendum to its Final Tribal Environmental Evaluation (January 2013) to address a proposed modification to its previously-approved gaming facility, located in unincorporated San Diego County (**Figure 1**). (References in this Addendum to the "Final Tribal Environmental EE" are intended to mean the Final Tribal Environmental Evaluation, together with a February 2014 Addendum (Temporary/Permanent Features, and Air Quality Supplement), and June 6, 2014 Addendum (Long Soil Nails). The proposed modification, which is intended to increase site-related efficiencies during construction of the gaming facility, consists of a change in the location of temporary employee parking and material laydown areas. The proposed modifications relate only to temporary construction activities; therefore, no change would occur to gaming related uses or intensity (e.g., height, massing and square footage). Additionally, no increase to off-site traffic (construction or operation) would result from the proposed change. The attached Environmental Checklist (**Table 1**) concludes that no new significant environmental impacts would result from the proposed change.

In connection with the certification of the Final Tribal EE and approval of the gaming project in January 2013, various mitigation measures were adopted that were designed to mitigate potentially significant construction and operational impacts. The adopted mitigation measures for the gaming project are hereby incorporated into this Addendum by reference and made part of this Addendum. Additionally, select setting discussions (where noted in the attached checklist) are hereby incorporated by reference into this Addendum from the *Final Tribal Environmental Evaluation: Jamul Indian Village Gaming Development Project* (January 2013).

ADDENDUM PROJECT DESCRIPTION

The Tribe is proposing the temporary use of approximately 2.1 acres of the adjacent 87-acre parcel (APN 597-060-05-00) during construction of the gaming facility for possible staging/laydown and parking (**Figure 2**). This particular temporary use area was chosen to minimize potential environmental impacts; no sensitive habitats exist within the area, no special-status species occupy the area, no cultural or historical resources occupy the area, and the area it is hidden from most vantage points.

The staging facilities could include the housing of tools, equipment, and building assembly operations in connection with the construction of the Jamul Gaming facility on the adjacent Reservation. Other activities within the staging area would include construction vehicle movements, as well as overnight storage of construction equipment. Deliveries to the site would occur during standard construction hours and access would occur via the Jamul Indian Village.

A construction lay down area could also be established on the 2.1 acre site. This area could be used for the lay down of construction material brought in via an access road from the Jamul Indian Village. In all phases of construction, all traffic would enter/exit SR-94 via existing Daisy Drive.

Lastly, a temporary construction parking area could be established with construction vehicles entering and exiting the 2.1 acre site through the Jamul Indian Village. The internal access would include 20-foot (approximate) wide lanes between the rows of parking stalls. Individual parking stall would measure approximately 20-feet long by 15-feet wide. The total number of stalls provided would vary depending on the area needed for staging and laydown.

Method of Procedure

The existing ground surface would be protected by the placement of a temporary covering of construction (geotextile) fabric, similar to weed cloth or filter fabric. No grading, grubbing or clearing of the land would occur. Two to three inches of gravel (not to exceed 200 cubic yards) would be applied to key access and roadways to provide a stable base for vehicles and heavy truck use. Parking stalls would be covered with wood chips/shavings. An erosion control and pollution prevention plan would be implemented that ensures dripping or leaking fluids from vehicles would be cleaned and removed (**Appendix A**). The implementation of the erosion control and pollution prevention plan would also ensure proper control and treatment of storm-water entering and leaving the site.

After the temporary use period (approximately 15 months), all vehicles and construction materials would be removed; then the gravel/wood chips and construction fabric would be removed. Finally, a habitat restoration/enhancement plan (**Appendix B)** would be implemented to return the temporary use area to pre-project (at a minimum) conditions. The habitat restoration/enhancement plan includes removal of invasive species, aeration of the soil where compacted, and the planting and irrigation of native plants to re-establish native grassland habitats.

The following pre-project biological resources surveys will occur for the temporary parking and laydown areas:

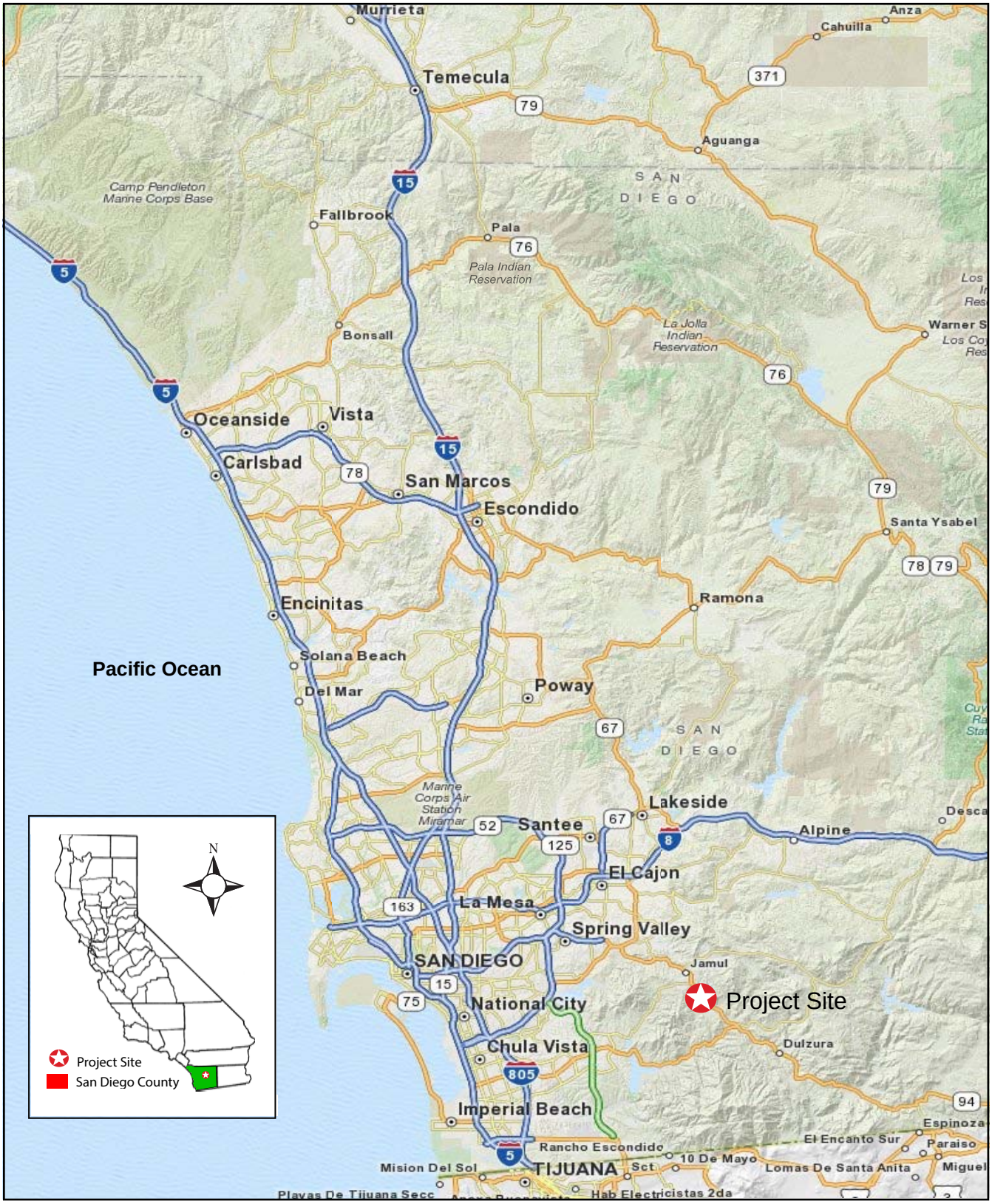
- Pre-project surveys for special-status species and protected species (i.e., meeting the standards of CDFW and USFWS) will be performed by a qualified biologist to confirm that neither threatened nor endangered species are present. If any special-status species or protected species are detected, construction will be delayed, the appropriate wildlife agencies will be consulted (e.g. California Department of Fish and Wildlife, U.S. Fish and Wildlife Service) and avoidance measures implemented.

- Pre-project surveys for nesting birds also will be performed by a qualified biologist to further confirm that no nesting birds (especially raptors or migratory species) are present. If active nesting is detected, California Department of Fish and Wildlife will be consulted to determine the most appropriate protective measures.

As mentioned above, an erosion control/pollution prevention plan would be implemented to ensure that any spills or leaks would be contained and cleaned and that stormwater entering and leaving the site

would be properly controlled and treated. The following Best Management Practices and erosion control devices are prescribed for this project:

- worker environmental awareness training to educate personnel about the project boundaries and construction Best Management Practices and the consequences of violating them,
- geotextile / weed fabric placed on the ground surface to ensure that no topsoil is disturbed,
- orange worker exclusion fencing installed along perimeter to contain all personnel and equipment within the project area,
- silt fence and fiber rolls installed in sloped areas to control stormwater sheet flow,
- gravel bags and sand bags deployed in swales and gullies to slow stormwater flow and prevent erosion,
- daily inspections of the parking area for litter and fluid leaks, weekly storm preparedness inspections, and daily erosion control device inspections during rain events,
- emergency response spill kits placed in strategic locations throughout the parking area to catch any dripping or leaking fluids from vehicles or material storage, and
- stockpiling of additional erosion control products to be deployed in case of a large storm event.



SOURCE: Microsoft Streets and Trips, 2014; EDS, 2014

Figure 1
Regional Location Map

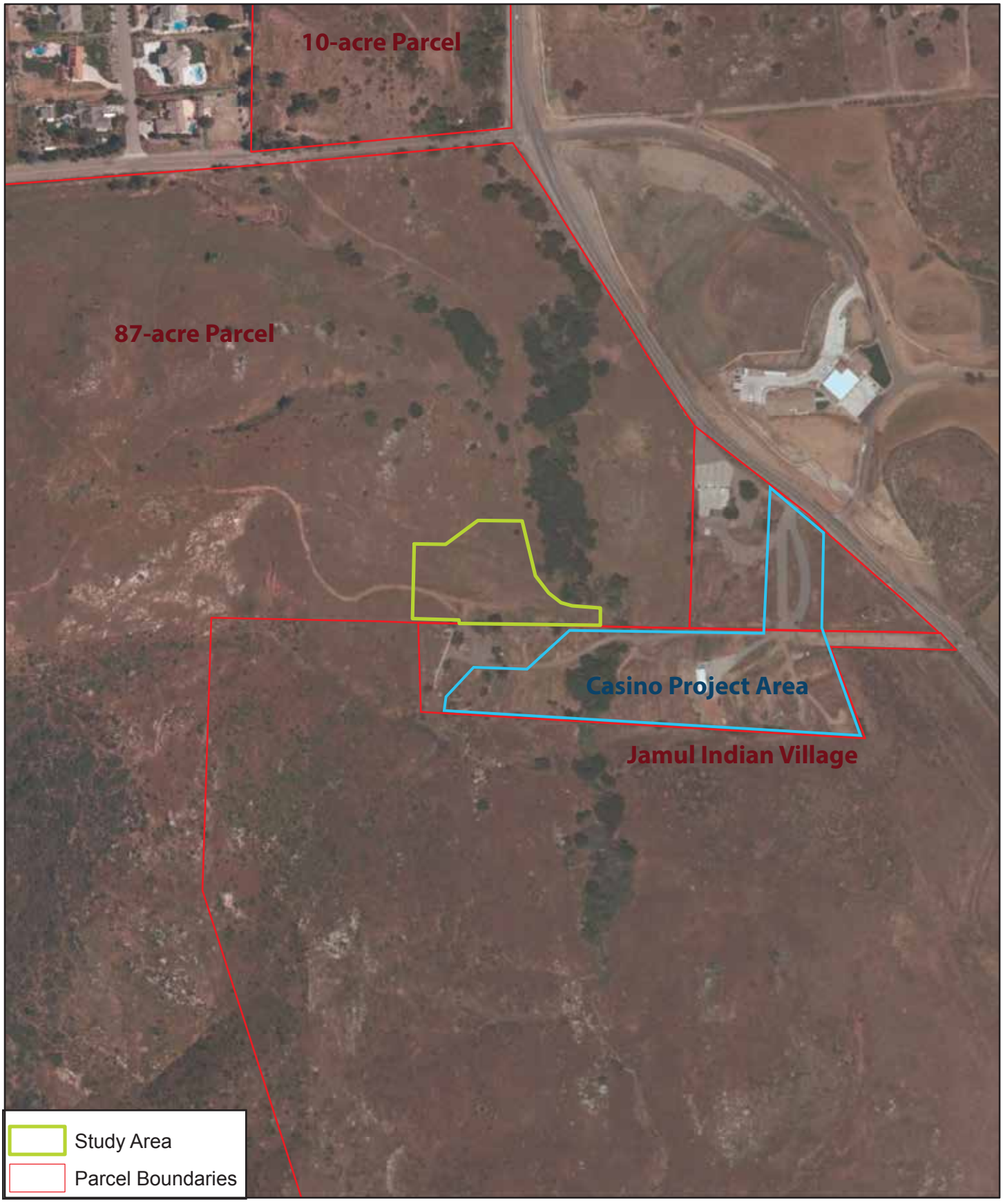


Figure 2
Location of Addendum Project Area in Relation to Adjacent Properties

TABLE 1
OFF-RESERVATION ENVIRONMENTAL CHECKLIST

I. Aesthetics

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a.) Have a substantial adverse effect on a scenic vista?			√
b.) Substantially damage off-reservation scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?		√	
c.) Substantially degrade the existing visual character or quality of the site and its surroundings?		√	
d.) Create a new source of substantial light or glare, which would adversely affect day or nighttime views of historic buildings or views in the area?		√	

Discussion:

The aesthetics setting for the project area is fully described in Section 4.3 of the Final Tribal EE. The setting description of the Final Tribal EE includes a discussion of the project area view shed and regulatory setting. The aesthetics setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

The new, temporarily visible feature addressed within this Addendum is the temporary parking area on the north side of the Reservation. There are no new permanent visible features proposed. No electrical lighting is proposed, and thus the temporary facilities will not create a new source of substantial light or glare.

Natural topography and the riparian corridor of Willow Creek block views of this temporary facility from SR94. The temporary facilities would be visible to only to a few residents from Melody Road. The temporary facilities would be visible to these residents in a manner that is subordinate to the distant landscape and does not occlude the skyline. Furthermore, the facilities will be removed in approximately 15 months and the original landscape restored. As such, the features of the Addendum are not expected to substantially damage off-reservation scenic resources or substantially degrade the existing visual character or quality of the site and its surroundings. Therefore, the aesthetic impacts of these temporary facilities are less than significant.

II. Agriculture and Forestry Resources

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?			√
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?			√

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?			√
d) Result in the loss of forest land or conversion of forest land to non-forest use?			√
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?			√

Discussion:

In the past, the 87-acre parcel was used for cattle ranching. The land is now vacant, and is thus not farmland. However, if the land were conservatively considered to be farmland, because only temporary uses are proposed, the features contemplated by this Addendum would not result in the conversion of farmland to non-agricultural uses. No temporary or permanent impact to prime farmland, unique farmland, or farmland of statewide importance would occur from implementation of the features of the Addendum. Because the temporary use area is devoid of trees, the features of the Addendum would not result in the loss of forest land or convert forest land to non-forest use. The features of the Addendum would not conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)). Lastly, the Addendum would not conflict with existing zoning for agricultural use or Williamson Act contract lands.

III. Air Quality

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?		√	
b) Violate any air quality standard or contribute to an existing or projected air quality violation?		√	
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors?)		√	
d) Expose off-reservation sensitive receptors to substantial pollutant concentrations?		√	
e) Create objectionable odors affecting a substantial number of people?			√

Discussion:
The air quality setting for the project area is fully described in Section 4.11 of the Final Tribal EE. The setting description of the Final Tribal EE includes a discussion of the existing air quality setting, air pollutants and regulatory setting. The air quality setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference. The features of the Addendum would not substantially increase construction/operational mobile source emissions beyond those considered in the Final Tribal EE, because no new vehicular trips are proposed. The Final Tribal EE assessed all construction activities (and their emissions) on the project site, including the ingress/egress of the vehicles of construction workers. Construction-related emissions were addressed in Impact 4.11(1-3) of the Final Tribal EE. Any minor temporary PM10 emissions resulting from vehicular traffic would have also been accounted for in those calculations, which were found to be less than significant (including ozone precursors). There will be no fugitive dust generation from the establishment or removal of the proposed temporary parking lot and laydown areas, because of the placement of geotextile fabric and gravel and periodic watering (which is prescribed in the storm water pollution prevention plan), which together will prevent ground disturbance and the dust generation.

IV. Biological Resources

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		√	
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?		√	
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		√	
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		√	
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?		√	
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?		√	

Discussion:

The biological resources setting for the project area is fully described in Section 4.7 of the Final Tribal EE. The setting description of the Final Tribal EE includes a discussion of the regional setting, vegetation communities and wildlife habitat types, protected water resources, special status species and regulatory setting. The biological resources setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

a) The 87-acre parcel (now vacant) was used for at least 60 years as cattle pasture, and natural habitats have been substantially degraded from grazing pressure and the spread of exotic pasture grasses and forbs. The proposed temporary parking and laydown area contains no sensitive habitats, but only developed/disturbed areas or non-native annual grassland. The location of the proposed temporary parking and laydown area that is the subject of this Addendum does not include any sensitive habitat types (such as coastal sage scrub or oak riparian forest).

A September 2014 biological survey of the proposed temporary parking and laydown area did not detect any special-status species or other direct biological impacts (**Attachment B**); similar non-detects were reported in general and protocol surveys of the project site over the last twelve years. As disclosed in the Final Tribal EE, numerous special-status species occur in the Jamul region. The California Department of Fish and Wildlife (CDFW) California Natural Diversity Database does not report any special status species within the project site, and numerous surveys conducted have not detected any special-status species within the site affected by the features of the Addendum. A protocol survey in 2001 did detect coastal California gnatcatcher on the Rancho Jamul Ecological Reserve (RJER) south of the project site. The establishment , use, and removal of the proposed temporary parking and laydown area for purposes described in the Addendum would not result in take of the California gnatcatcher. While the mitigation measures in the Final Tribal EE (including Mitigation Measure 4.7(1)) are sufficient to mitigate any impacts to nesting birds, reptiles, and small mammals to a less than significant level, the project description for this Addendum also includes implementation of best management practices relating to biological resources that will further assure that biological resources in the area will be protected throughout construction and use of the proposed temporary parking and laydown area and its subsequent removal. Furthermore, a net-benefit to special status species would occur because this Addendum proposes a Habitat Restoration Plan (**Appendix B**) that will include the removal of invasive species, aeration of the soil where compacted, and the planting and irrigation of native plants to re-establish annual grassland habitats. Impacts to special-status species therefore would be less than significant.

b) No riparian habitat exists in the proposed temporary parking and laydown area; the nearby Willow Creek riparian corridor is located outside of the proposed temporary parking and laydown area, and will be protected with exclusion fencing and signage. The proposed project does not involve grubbing or other ground disturbance. The proposed temporary parking and laydown area will not be located on, or have any impact on, any other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service. Therefore, impacts to sensitive natural communities will be less than significant.

c) The proposed temporary parking and laydown area was formally assessed for wetlands and other jurisdictional water resources during a comprehensive delineation by Natural Investigations Co. in 2007 and 2011, which was verified by USACE. The proposed temporary parking and laydown area contains no wetlands or other water resources, and thus, no jurisdictional waters. The nearby Willow Creek riparian corridor is excluded from project development and will be protected with exclusion fencing and signage. An storm water pollution prevention plan will be implemented to ensure that no pollutants contaminate stormwater. No impacts to wetlands or other jurisdictional waters will occur.

d) Within the vicinity of the proposed temporary parking and laydown area, several wildlife corridors exist: the Willow Creek riparian corridor; the Jamul Creek riparian corridor; and the CDFW preserve areas (Rancho Jamul Ecological Reserve and Hollenbeck Canyon Wildlife Area). The adjacent Willow Creek riparian corridor is excluded from project development and will be protected with exclusion fencing and signage. No fishery resources exist in the Study Area because all drainages flow only ephemerally or intermittently and spawning substrate is absent. The proposed fenced area is very small in comparison to the available preserve lands, and the proposed parking and laydown areas will be temporary. The fencing will also discourage animals from entering construction areas, which is a beneficial impact. The proposed project therefore will not significantly interfere with wildlife movement.

e,f) The Study Area contains no trees, so there will be no conflict with tree preservation ordinances. The proposed location of the temporary parking and laydown area is within the MSCP South County Subarea Plan, which protects natural habitats within the Study Area (annual grassland). Ground disturbance and vegetation removal and other

construction activities would conflict with the natural community conservation goals of the South County Subarea Plan. However, the proposed project does not involve any clearing, grubbing, or grading. Furthermore, the habitat restoration plan that will be implemented in connection with the removal of the parking and laydown area includes the removal of invasive species, aeration of the soil where compacted, and the planting and irrigation of native species to re-establish the native grassland community; this will result in a net conservation benefit to the area. Conflicts with habitat conservation plans therefore will be less than significant.

V. Cultural Resources

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?		√	
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?		√	
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		√	
d) Disturb any human remains, including those interred outside of formal cemeteries?			√

Discussion:

The cultural resources setting for the project area is fully described in Section 4.8 of the Final Tribal EE. The setting description of the Final Tribal EE includes a discussion of cultural history, cultural/paleontological resources and regulatory framework. The cultural/paleontological setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

a & b) No built resources have been recorded within the project area and no cultural resources were identified within the site of the proposed temporary parking and laydown area during the pedestrian surveys performed by a qualified archaeologist on September 4, 2014. Archaeological sites to exist in the vicinity of the proposed temporary parking and laydown area (summarized in Sikes and Arrington 2014). The proposed temporary parking and laydown area is located at least 300 feet from all known archaeological resources. The placement of signage and perimeter fencing and the implementation of worker awareness training will ensure that workers and all construction activities remain within the project area and casino project area. Coverage of the area with protective fabric (geotextile) will ensure that ground disturbance does not occur. Therefore, there will be no significant impacts resulting from inadvertent damage or destruction of cultural resources during use of the temporary parking and laydown area.

c) A review of the paleontological locality maps by the San Diego Museum of Natural History identified no recorded fossil sites on the project site or in the immediate surrounding area. Additionally, the museum's review of available geologic maps confirmed that the geologic formations (igneous rock and alluvial veneers) that underlie the project site have a low probability of containing paleontological resources.

d) The project would not affect human remains, including those outside those interred outside formal cemeteries.

VI. Geology and Soils

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Expose off-reservation people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:			
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.		√	
ii) Strong seismic ground shaking?		√	
iii) Seismic-related ground failure, including liquefaction?		√	
iv) Landslides?		√	
b) Result in substantial soil erosion or the loss of topsoil?		√	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?		√	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?		√	
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?		√	

Discussion:

The geology and soils setting for the project area is fully described in Section 4.4 of the Final Tribal EE. The setting description in the Final Tribal EE includes a discussion of regional and local geologic setting, topography and soils, mineral resources, fault rupture and earthquake hazards, and regulatory setting. The geology and soils setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

a,c,d) No seismic or geologic hazards were identified in connection with the establishment, use, or removal of the temporary parking and laydown area contemplated by this Addendum. The features of this proposal do not involve the erection of any structures, thus risks to the health or safety of workers or members of the public would be less than significant. Given that the site is underlain by solid bedrock, liquefaction is not an issue for the project site.

b) Because implementation of the features do not involve grading, grubbing, or other land disturbance, no impacts from soil erosion are expected. The prescribed use of geotextiles and gravel cover, together with best management practices that include implementation of a storm water pollution prevention plan, will ensure that stormwater is adequately controlled and filtered.

e) No wastewater disposal is proposed as part of the establishment of the temporary parking and laydown area contemplated by this Addendum.

VII. Greenhouse Gas Emissions

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?		√	
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?		√	

Discussion:

The greenhouse gas emissions setting for the project area is described in Section 4.11 of the Final Tribal EE. The greenhouse gas setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

The features contemplated by this Addendum would not substantially increase construction/operational mobile source emissions beyond those considered in the Final Tribal EE because no new vehicle trips are proposed. The Final Tribal EE assessed all construction activities (and their emissions) on the project site, including the ingress/egress of the vehicles of construction workers. Construction related emissions were addressed in Impact 4.11(1-3) of the Final Tribal EE. Any minor temporary GHG emissions resulting from vehicular traffic would have also been accounted for in those calculations, which were found to be less than significant (including ozone precursors). None of the features of the Addendum would increase operational emissions beyond those already evaluated in the Final Tribal EE. No additional GHG impacts beyond those evaluated in the Final Tribal EE would be generated by the features of the Addendum. A less than significant GHG impact would occur.

VIII. Hazards and Hazardous Materials

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?		√	
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		√	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?		√	
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?			√
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would			√

the project result in a safety hazard for people residing or working in the project area?			
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?			√
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?		√	
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?		√	

Discussion:

The hazards and hazardous materials setting for the project area are fully described in Section 4.6 of the Final Tribal EE . The setting description within the Final Tribal EE includes a discussion of current conditions and land use, previous environmental assessments, environmental database queries, site reconnaissance and regulatory setting. The hazardous and hazardous materials setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

Various Phase 1 Environmental Site Assessments performed by Natural Investigations Co. have assessed the establishment, use, and removal of the proposed temporary parking and laydown area, and none of these assessments has detected any evidence of environmental contamination. None of these assessments recommended further investigation and none identified any land-use restrictions.

The issue of accidental release of hazardous materials during construction was addressed within Impact 4.6(1) of the Final Tribal EE. As stated in that discussion, small amounts of fluids (oil, grease, coolant) could drip from parked vehicles; however the NPDES requirements implemented by the project, including an effective spill prevention and response program, would reduce the potential impacts of accidental release of small amounts of petroleum products during construction to a less-than-significant level. Furthermore, the proposed groundcover (geotextile and gravel) will function as an effective barrier and absorbent material, and will be removed after the temporary use is concluded.

Portions of the project area are covered in fuel-rich vegetation, such as grasses, leaf litter, or resinous shrubs. The project area is located within an area of moderate to high fire hazard. However, potential impacts related to wildfires during project construction of the features of the Addendum are considered less than significant with implementation of Final Tribal EE Mitigation 4.6(4), which have been incorporated into the Addendum description.

IX. Hydrology and Water Quality

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Violate any water quality standards or waste discharge requirements?		√	
b.) Substantially deplete off-reservation groundwater supplies or interfere substantially with groundwater recharge such that there should be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells drop to a level which would not support existing land uses or planned uses for which permits have been granted)?			√

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation off-site?		√	
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding off-site?		√	
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted run off-reservation		√	
f) Otherwise substantially degrade water quality?		√	
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?			√
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?			√
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?			√
j) Inundation by seiche, tsunami, or mudflow?			√

Discussion:

The hydrology and water quality setting for the project area is fully described in Section 4.5 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of current conditions related to surface water, drainage and flooding, ground water, water quality and the regulatory setting related to these topics. The hydrology and water quality setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

a-f) Implementation of the features contemplated by this Addendum does not involve water discharges, and would not result in the disturbance of soils that could be subject to erosion and transported to receiving waterbodies. The riparian corridor was excluded from project development and will be protected with exclusion fencing and signage. As part of the best management practices for the project, a storm water pollution prevention plan and spill prevention and response plan will be implemented to ensure that no pollutants contaminate stormwater. No significant impacts to water quality will occur.

g-j) No structures are proposed. The proposed temporary parking and laydown area would be located outside of the 100-year flood hazard area. No other hydrologic hazards are present.

X. Land Use and Planning

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Physically divide an established community?		√	
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?		√	
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?		√	

Discussion:

The land use and planning setting for the project area are fully described in Section 4.2 of the Final Tribal EE . The setting description within the Final Tribal EE includes a discussion of the regional setting, Jamul/Dulzura Subregion setting, project area setting, project site setting and a discussion of the land use guidance documents applicable to the site. The land use setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

a) The temporary features of the Addendum are designed to create efficiencies during construction of the approved Jamul Gaming Facility. None of the proposed temporary features would physically divide an established community.

b) Implementation of the features contemplated by this Addendum would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project that was adopted for the purpose of avoiding or mitigating an environmental effect.

c) The 2.1 acre site is located within the County's Multiple Species Conservation Program (MSCP), County Subarea Plan, South County Segment, and is designated as hardline preserve. Although the development of permanent, paved parking lots would not be consistent with MSCP land designated as hardline preserve, the establishment, use and removal of proposed temporary areas (for parking and laydown activities) do not entail any ground disturbance and are not permanent facilities, and implementation of the planned habitat restoration and enhancement plan in connection with the removal of the parking and laydown area will result in a net conservation benefit because the area temporary parking and laydown area will be converted from non-native annual grassland to native grassland. Thus, after the temporary use period, this area will have higher habitat quality and ecosystem functioning, which is consistent with the guidelines for this MSCP designation. Therefore, implementation of the features contemplated by this Addendum will not conflict with the applicable habitat conservation plan (the MSCP) or any other conservation plan.

XI. Mineral Resources

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?			√
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?			√

Discussion:
The geology and soils setting for the project area is fully described in Section 4.4 of the Final Tribal EE . The setting description in the Final Tribal EE includes a discussion of regional and local geologic setting, topography and soils, mineral resources, fault rupture and earthquake hazards, and regulatory setting. The geology and soils setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference. The affected project area does not contain any rare, high quality, or scientifically significant geologic or topographic resources, and does not encompass any areas designated as National Natural Landmarks. The features contemplated in the Addendum would not adversely affect any known or recorded mineral resources. The establishment, use and removal of the proposed temporary parking and laydown area would not result in a loss of economically viable aggregate rock or diminish the extraction of important ores or minerals. Because there are no known or mapped mineral resources within the project area, use of the land would not be affected by such resources. Thus, implementation of the features contemplated in the Addendum would have no significant adverse effect upon mineral resources.

XII. Noise

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		√	
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?		√	
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?		√	
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?		√	
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?			√
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?			√

Discussion:
The noise setting for the project area is fully described in Section 4.10 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of sensitive noise receptors in the project area and existing noise levels. The noise setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference. The features of the Addendum would not substantially increase construction noise or vibration beyond those considered in the Final Tribal EE because no new vehicular trips are proposed. The Final Tribal EE assessed noise and vibrations generated from construction activities on the project site, including the ingress/egress of the vehicles of construction workers. The proposed relocation of the construction worker vehicles a few hundred feet north of the original location will not significantly change the noise environment or the noise level of sensitive receptors. The 2.1 acre site is in a sheltered valley without line-of-sight for the vast majority of adjacent residences; in other words, natural barriers will attenuate sound generated from parking and laydown activities. Thus, features contemplated in this Addendum would not increase construction noise or vibration beyond that already addressed in the Final Tribal EE. As such, the features contemplated by this Addendum would have less than significant noise impacts.

XIII. Population and Housing

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			√
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?			√
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?			√

Discussion:

The population and housing setting for the project area is fully described in Section 4.16 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of population and housing within San Diego County and Jamul. The population and housing setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference. The temporary features of the Addendum would not result in new or substantially more severe population and/or housing impacts, as they do not include any permanent infrastructure or permanent structures.

XIII. Public Services

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:			
Fire Protection?			√
Police Protection			√
Schools?			√
Parks?			√
Other public facilities?			√

Discussion:

The public services setting for the project area is fully described in Section 4.12 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of water supply, wastewater service, solid waste service, electricity, natural gas and telecommunications, law enforcement, and fire protection and emergency services. The setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

The features contemplated by this Addendum would have no impact related to fire protection and police protection services, schools, parks, and other public facilities because the establishment, use, and removal of the parking and laydown area do not generate a need for any such public utilities. Similarly, none of the features contemplated by this Addendum are expected to result in additional fire or law enforcement issues beyond those identified in the Final Tribal EE. There would be no impact related to public services.

XV. Recreation

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?		√	
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?		√	

Discussion:

In the vicinity of the 2.1 acre site is a mix of preserves and open lands which afford limited recreational opportunities. The Hollenbeck Canyon Wildlife Area offers hiking opportunities and is located approximately 4 miles south of the Reservation. The area is also home to a number of reserves, preserves and reservoirs, which provide recreational opportunities to area residents and visitors - Rancho Jamul Ecological Reserve, Otay Mountain Ecological Reserve, Sycuan Peak Ecological Reserve, McGintry Mountain Ecological Reserve, Otay Reservoir, Sweetwater Reservoir, as well as others. Other recreational opportunities identified by the public include school fields and stables/equestrian training centers. The features analyzed in this Addendum would not result in any significant impacts related to recreational resources, because no new construction activities are proposed and the 2.1 acre site is not visible from most vantage points.

XVI. Transportation and Traffic

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?		√	
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?		√	
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?		√	
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		√	
e) Result in inadequate emergency access?		√	
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?		√	

Discussion:

The transportation/circulation setting for the project area is fully described in Section 4.9 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of the road network, roadway segments, existing conditions, near term conditions, and horizon year conditions. The transportation/circulation setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference.

The features of the Addendum would not increase construction or operational traffic beyond that evaluated in the Final Tribal EE. This Addendum shifts the location of construction worker parking but does not affect the amount of traffic that would leave/arrive at the project site, or the point of departure/arrival. The proposal is only to shift the temporary parking from the Reservation a few hundred feet to the 87-acre parcel; the actual volume of construction-related parking will not change. The construction related traffic analysis of the Final Tribal EE captured on-site construction features such as staging, extended haul route, etc. Basic construction assumptions used previously to factor construction related traffic included items such as the use of a staging area and parking – all basic construction related functions that were factored into the gross calculations.
No changes to construction or operational related traffic would result from the features of the Addendum. No impacts to circulation, safety, or other transportation issues will occur.

XVI. Utilities and Service Systems

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?			√
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			√
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			√
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			√
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?			√
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			√
g) Comply with federal, state, and local statutes and regulations related to solid waste?			√

Discussion:
The utilities and service system setting for the project area is fully described in Public Works Section 4.12 of the Final Tribal EE. The setting description within the Final Tribal EE includes a discussion of water supply, wastewater service, solid waste service, electricity, natural gas and telecommunications, law enforcement, and fire protection and emergency services. The Public Works setting description within the Final Tribal EE is hereby incorporated into this Addendum checklist by reference. Implementation of the features do not require utility connections or hookups. Therefore, utilities and service systems would not be impacted by the features of the Addendum.

XVIII. Mandatory Findings of Significance

Would the project	Potentially Significant Impact	Less than Significant	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		√	
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?		√	
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		√	

Discussion:
None of the features of the proposed temporary parking and laydown area contemplated in this Addendum would have the potential to: (1) degrade the quality of the environment – all impact conclusions are "less than significant" or "no impact", (2) substantially reduce the habitat of a fish or wildlife species – no fisheries exist and wildlife corridors would be maintained and enhanced, (3) cause a fish or wildlife population to drop below self-sustaining levels – see #2 above, (4) threaten to eliminate a plant or animal community – no threatened or endangered plant or animal community would be impacted by the features contemplated in this Addendum, (5) reduce the number or restrict the range of a rare or endangered plant or animal – see #4 above, or (6) eliminate important examples of the major periods of California history or prehistory – activity on the 87-acre parcel would not result in significant impacts to cultural/historical resources. Additionally, the features contemplated in this Addendum do not have impacts that are individually limited, but cumulatively considerable – the analysis concluded that there were no significant impacts associated with the proposed temporary parking and laydown area. The establishment, use, and removal of the proposed temporary parking and laydown area would not result in the additional permanent loss of sensitive habitat/plants/animals and the air and noise emissions and traffic associated with these activities would not exceed those previously evaluated in the Final Tribal EE. Lastly, the features contemplated in this Addendum would not cause a substantial adverse effect on human beings, either directly or indirectly, as they are limited to the establishment, use, and removal of a temporary area that contains no hazards to humans.

APPENDIX A

STORM WATER POLLUTION PREVENTION PLAN

STORM WATER POLLUTION PREVENTION PLAN FOR TEMPORARY CONSTRUCTION STAGING, 87-ACRE PARCEL, JAMUL, CALIFORNIA

Job Site Location:
87-Acre Parcel, Melody Road at SR-94, Jamul, California

SWPPP Preparation Date:
November 1, 2014

Prepared for:
San Diego Gaming Ventures, LLC, and Jamul Indian Village

Prepared by:
Dr. G.O. Graening, QSD #00473
Natural Investigations Company, LLC
6124 Shadow Lane, Citrus Heights, CA 95621

Estimated Construction Periods:
December 2014 through December 2017

Project General Contractor:
C.W. Driver, Inc.

Table of Contents

1.0 SWPPP CERTIFICATIONS AND REQUIREMENTS

1.1. Qualified SWPPP Developer Certification

This Storm Water Pollution Prevention Plan (SWPPP) conforms to the required elements of the State Water Resources Control Board (SWRCB)'s Construction General Permit:

> *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities Order No. 2009-0009-DWQ, NPDES No. CAS000002*.

The SWPPP must be developed and amended or revised by a Qualified SWPPP Developer (QSD). To demonstrate compliance with requirements of the Construction General Permit, the QSD shall include information in the SWPPP that supports the conclusions, selections, use, and maintenance of Best Management Practices (BMPs).

This SWPPP was developed by the following QSD: G.O. Graening, PhD.

Project Name: Temporary Construction Staging, 87-acre Parcel

"*I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation*s."

_____ _____

Qualified SWPPP Developer's Signature Date

G.O. Graening, PhD
Natural Investigations

1.2. Legally Responsible Party Approval and Certification of SWPPP

The SWPPP shall be signed and certified by the Legally Responsible Person, also known as the Discharger (and is typically the landowner or facility owner), in conformance with the Construction General Permit.

Project Name: Temporary Construction Staging, 87-acre Parcel

Legally Responsible Person: Norm Nelms, San Diego Gaming Ventures, LLC

"*I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations*."

_____ _____

Legally Responsible Party's Signature Date

1.3. Notice of Intent

The Legally Responsible Party submitted the Notice of Intent in early October. The Regional Water Quality Control Board (RWQCB) will issue a Waste Discharge Identification Number for this project. See Attachment A for a copy of the Notice of Intent and the RWQCB receipt.

1.4. SWPPP Amendments

This SWPPP shall be amended:

- Whenever there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- If any condition of the Permits is violated or the general objective of reducing or eliminating pollutants in storm water discharges has not been achieved. If the RWQCB determines that a Permit violation has occurred, the SWPPP shall be amended and implemented within 14-calendar days after notification by the RWQCB;
- Annually, prior to the defined rainy season; and
- When deemed necessary by the Legally Responsible Party or Qualified SWPPP Practitioner (QSP).

The following items will be included in each amendment: who requested the amendment; the location of proposed change; the reason for change; the original BMP proposed, if any; and the new BMP proposed. Any amendments to this SWPPP, along with the Legally Responsible Party's Certification and approval, can be found in Attachment B. Each amendment event shall be logged in the Amendment Log in Attachment B.

1.5. List of Responsible Parties and Contact Information

The QSP, also known as the Storm Water Pollution Prevention Manager, assigned to this project is: Dr. G.O. Graening.

The QSP shall have primary responsibility and significant authority for the implementation, maintenance, inspection, and amendments to the approved SWPPP. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Ensuring full compliance with the SWPPP and the Construction General Permit;
    - Implementing all elements of the SWPPP, including but not limited to implementation of prompt and effective erosion and sediment control measures, and implementing all non-storm water management, and materials and waste management activities (such as monitoring discharges (dewatering, diversion devices); general site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.);
- Inspections (pre-storm, during storm, and post-storm) or designating qualified personnel to do so;
- Routine inspections as specified in the project's specifications or described in the SWPPP;
- Preparing annual compliance certification;
- Ensuring elimination of all unauthorized discharges;
- The QSP shall be assigned authority by the Legally Responsible Party to mobilize crews in order to make immediate repairs to the control measures;
- Coordinate with the Legally Responsible Party and Contractor to assure all of the necessary corrections/repairs are made immediately, and that the project complies with the SWPPP, the Permit and approved plans at all times; and
- Submit Notices of Discharge and reports of Illicit Connections or Illegal Discharges.

Employees, contractors, and subcontractors, who will be directed by the QSP consist of trained personnel (see Attachment F).

1.6. Availability of the SWPPP

The Legally Responsible Person or QSP shall make the SWPPP available at the construction site during working hours while construction is occurring and shall be made available upon request by a state or municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone.

1.7. Annual Reporting Requirements

The Legally Responsible Person or QSP must prepare and electronically submit an Annual Report no later than September 1 of each year. The Legally Responsible Person shall certify each Annual Report in accordance with the Construction General Permit. The Legally Responsible Person shall retain an electronic or paper copy of each Annual Report for a minimum of three years after the date the annual report is filed. The Legally Responsible

Person or QSP shall include storm water monitoring information in the Annual Report consisting of:

- A summary and evaluation of all sampling and analysis results, including copies of laboratory reports;
- The analytical method(s), method reporting unit(s), and method detection limit(s) of each analytical parameter (analytical results that are less than the method detection limit shall be reported as “less than the method detection limit");
- A summary of all corrective actions taken during the compliance year;
- Identification of any compliance activities or corrective actions that were not implemented;
- A summary of all violations of the Construction General Permit;
- The names of individual(s) who performed the facility inspections, sampling, visual inspections, and/or measurements;
- The date, place, and time of facility inspections, sampling, visual inspections, and/or measurements, including precipitation (rain gauge); and
- The visual observation and sample collection exception records and reports specified in the Construction General Permit.

The Legally Responsible Person or QSP shall provide training information in the Annual Report consisting of:

- Documentation of all training for individuals responsible for all activities associated with compliance with this Construction General Permit;
- Documentation of all training for individuals responsible for BMP installation, inspection, maintenance, and repair; and
- Documentation of all training for individuals responsible for overseeing, revising, and amending the SWPPP.

Completed Annual Reports for this project can be found in Attachment D.

2.0 PROJECT DESCRIPTION AND SITE CALCULATIONS

2.1. Project Location and Description

The project is located on the 87-acre parcel in the southwest corner of the intersection of Melody Road and SR-94, Jamul, California (see Attachment C).

The Tribe is proposing the temporary use of approximately 2.1 acres of the adjacent 87-acre parcel (APN 597-060-05-00) during construction of the gaming facility for possible staging/laydown and parking. This particular temporary use area was chosen to minimize potential environmental impacts; no sensitive habitats exist within the area, no special-status species occupy the area, no cultural or historical resources occupy the area, and the area it is hidden from most vantage points.

The staging facilities could include office and storage trailers, which would be used to temporarily store construction materials, equipment, and to provide construction offices. The construction work force will start/finish their shifts and take breaks within the staging facilities. On-site meetings could be held at the staging offices. Other activities within the staging area would include construction vehicle movements, as well as overnight storage of construction equipment. Deliveries to the site would occur during standard construction hours and access would occur via the Jamul Indian Village.

A construction lay down area could also be established on the 2.1 acre site. This area could be used for the lay down of construction material brought in via an access road from the Jamul Indian Village. In all phases of construction, all traffic would enter/exit SR-94 via existing Daisy Drive.

Lastly, a temporary construction parking area could be established with construction vehicles entering and exiting the 2.1 acre site through the Jamul Indian Village. The internal access would include 20-foot (approximate) wide lanes between the rows of parking stalls. Individual parking stall would measure approximately 20-feet long by 15-feet wide. The total number of stalls provided would vary depending on the area needed for staging and laydown

2.2. Construction Site Estimates

The following table lists estimates of the construction site. Attachment A contains the support documentation and calculations.

Table 2-1 Construction Site Runoff Coefficient and Storm Water Flow

Parameter	Value
Construction site area	2.1 acres
Percentage impervious area before construction	less than 1 %
Runoff coefficient before construction	0.3
Percentage impervious area after construction	less than %
Runoff coefficient after construction	0.3
Anticipated storm water flow on to the construction site	less than 1 cfs

2.2.1. Risk Level Calculation

The site's sediment risk and receiving water risk must be calculated during periods of soil exposure (i.e. grading and site stabilization), and then used to determine a Risk Level(s) using the methodology in Appendix 1 of the Construction General Permit. The site's Risk Level determination must be included in the Permit Registration Documents.

Step 1: Determine Sediment Risk

The Watershed Erosion Rate Estimate must be calculated (in tons/acre); the formula is R x K x LS, where:

- R is the rainfall erosivity factor;
- K is the soil-erodibility factor; and
- LS combines the effects of a hillslope length factor, L, and a hillslope-gradient factor, S

The project site's R Factor Value was calculated using the United States Environmental Protection Agency's (USEPA) Rainfall Erosivity Factor Calculator (http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm), and the following inputs:

- start date (date of initial earth disturbance): December 1, 2014
- end date (date of final site stabilization): December, 2016
- site coordinates of Latitude: 32.703775° N and Longitude: 116.871424° W

The project site's R Factor Value is: 85.61.

The project site's K Factor value was determined by the SWRCB's RUSLE K FACTOR Map = 0.16

LS was calculated using Table 3.1 in Renard et. al. (1997) and the following inputs:

- Sheet flow length (feet) = 1,000
- Average watershed slope (%) = 2%

Thus, the LS Factor = 0.69.

Thus, the Watershed Erosion Estimate (R x K x LS) for the project site is: 85.61 x 0.16 x 0.69 = 9.45 tons/acre.

The Site Sediment Risk Factor is determined by the magnitude of the Watershed Erosion Estimate, according to the following criteria:

- Low Sediment Risk: < 15 tons/acre
- Medium Sediment Risk: >/=15 tons/acre and < 75 tons/acre
- High Sediment Risk: > 75 tons/acre

Thus, the Site Sediment Risk Factor for the project site is: LOW

Step 2: Determine Receiving Water Risk

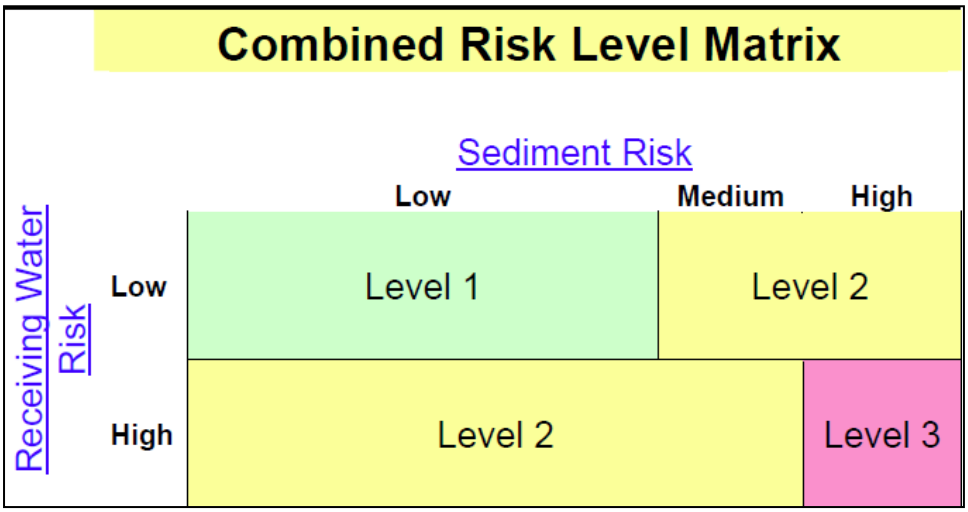
The Receiving Water Risk Factor is "HIGH" if either of the following is true for the project site:

- The disturbed area discharges (either directly or indirectly) to a 303(d)-listed waterbody impaired by sediment, or that has a USEPA-approved total maximum daily load implementation plan for sediment.
  (Impaired waterbodies listed on the Internet at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml); or
- The disturbed area discharges to a waterbody with designated beneficial uses of "SPAWN" and "COLD" and "MIGRATORY" (geographic information system method, online map at http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp)

The project site does not discharge directly or indirectly to an impaired waterbody or a waterbody designated with special uses. The Receiving Water Risk Factor is: Low.

Step 3: Determine Combined Risk Level

The calculated site sediment risk and receiving water risk are combined in the following matrix to determine the Risk Level:



The Sediment Risk Level for this project is Low and the Receiving Water Risk Level is Low, thus the Risk Level for this project is Risk Level 1. Attachment A contains the support documentation and calculations for the risk level determination for this project.

2.3. Project Schedule/Water Pollution Control Schedule

The following table summarizes major construction phases, and how these construction phases are sequenced with implementation of construction site BMPs.

Table 2-2 Construction Schedule and SWPPP Activities

Phase, Activity, or Milestone	Date
File Notice of Intent and permit registration documents	November 2014
Estimated construction start	December 2014
Implementation of rainy season BMPs	December 2014
Implementation of dry season BMPs	March 2014
Rainy season ends	April 15, 2014
Estimated construction finish	December 2016
Final Stabilization	December 2016
Submit Annual / Final Report	before September 1 of every year
File Notice of Termination	January 2017

3.0 STORM WATER MANAGEMENT PLAN

3.1. Site Layout Maps and Water Pollution Control Drawings

The construction project site layout maps and the Water Pollution Control Drawings are presented in Attachment C.

3.2. Pollutant Source Identification and BMP Selection

3.2.1. Inventory of Materials and Activities that May Pollute Storm Water

Construction activities that have the potential to contribute sediment to storm water discharges include:

- soil import/export operations;
- employee parking; and
- material laydowns.

The following table provides a list of construction materials that may be used and activities that may be performed that will have the potential to contribute pollutants, other than sediment, to storm water runoff.

Table 3-1. Summary of Potential Project Pollutant Other Than Sediment

Activity/Material Type	Potential Pollutant
Vehicle lubricants and fuels, including oil, grease, diesel and gasoline, and coolants	Petroleum hydrocarbons, volatile organic compounds (VOC)
Asphaltic emulsions associated with asphalt-concrete paving operations	Petroleum hydrocarbons, VOCs
Portland cement, masonry, and concrete products, muriatic acid, etc.	Materials with a low or high pH, materials with high alkalinity, metals
Base and subbase material	Materials with high alkalinity or high pH, metals
Adhesives, paints, solvents, etc.	VOCs, SVOCs, metals
Landscaping materials and wastes	Pesticides, biological oxygen demand, metals
Treated lumber (materials and waste)	Arsenic, copper, other metals, creosote
Building material packaging and construction personnel	General litter (municipal solid waste, universal waste)
Portable toilets	Septic waste (fecal coliform, biological oxygen demand)

3.2.2. Selection of Best Management Practices

Resources consulted for BMP selection included:

- California Storm Water Association's 2009 Storm Water Handbook, available electronically at http://www.cabmphandbooks.com
- The California Department of Transportation's Construction Site BMPs Handbook, available electronically at http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm

- The California Department of Transportation's Construction Site BMP Fact Sheets, available electronically at http://www.dot.ca.gov/hq/construc/stormwater/factsheets.htm
- USEPA NPDES Storm Water Program's National Menu of BMPs website at http://www.epa.gov/npdes/stormwater/menuofbmps

The following sections list all BMPs that have been selected for implementation in this project. Implementation and location of BMPs are shown on the Waste Pollution Control Drawings (WPCDs) in Attachment C. Narrative descriptions of BMPs to be used during the project are listed by category in each of the following sections. Attachment E includes a list of the fact sheets of all the BMPs selected for this project.

3.2.3. Existing (pre-construction) Control Measures

There are no existing (pre-construction) control measures within the project site.

3.2.4. Nature of Fill Material and Existing Data Describing the Soil

No known fill is present at the site. Soils have a moderate erosion potential.

3.2.5. Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles. This project will incorporate erosion control measures required by the contract documents, and other measures selected by the QSD or QSP. This project will implement the following practices for effective temporary and final erosion control during construction:

- Preserve existing vegetation where required and when feasible;
- Apply temporary erosion control to remaining active and non-active areas as required by the California Stormwater BMPs Handbook – Construction, and the contract documents. Reapply as necessary to maintain effectiveness;
- Implement temporary erosion control measures at regular intervals throughout the defined rainy season to achieve and maintain the contract's disturbed soil area requirements. Implement erosion control prior to the defined rainy season;
- Stabilize non-active areas as soon as feasible after the cessation of construction activities;
- Control erosion in concentrated flow paths by applying erosion control blankets, erosion control seeding, and lining swales as required in the contract documents;
- Apply seed to areas deemed substantially complete by the QSP during the defined rainy season; and
- At completion of construction, apply permanent erosion control to all remaining disturbed soil areas.

Sufficient erosion control materials will be maintained on-site to allow implementation in conformance with Permit requirements and described in this SWPPP. This includes implementation requirements for active areas and non-active areas that require deployment before the onset of rain. Implementation and locations of temporary erosion control BMPs are shown on the WPCDs in Attachment C and/or described in this section. The BMP Consideration Checklist in the following table indicates the BMPs that were considered and those that were selected to control erosion on the construction site.

Table 3-2 Consideration Checklist for Erosion Control BMPs

BMP No.	BMP	Considered For Project	Used	Not Used	If not used, state reason
EC-1	Scheduling	X	X		
EC-2	Preservation of Existing Vegetation	X	X		
EC-3	Hydraulic Mulch	X	X		will be used in restoration phase
EC-4	Hydroseeding	X	X		will be used in restoration phase
EC-5	Soil Binders	X	X		
EC-6	Straw Mulch	X	X		
EC-7	Geotextiles & Mats	X	X		
EC-8	Wood Mulching	X	X		
EC-9	Earth Dikes & Drainage Swales	X	X		
EC-10	Velocity Dissipation Devices	X	X		
EC-11	Slope Drains	X	X	X	Not needed on this site

Geotextiles & Mats

A geotextile or filter fabric will be used to protect existing vegetation and prevent erosion.

Wood, Straw, or Gravel Mulch

Mulch may be used throughout the site to protect the geotextile/filter fabric and to prevent erosion.

Earth Dikes/Drainage Swales

Several drainage swales exist on the project site. Gravel bag or sandbag barriers, or cobble fill, may used to prevent swales from eroding further.

3.2.6. Sediment Control

Sediment controls are structural measures that are intended to complement and enhance the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. This project will incorporate sediment control measures required by the contract documents, and other measures selected by the QSD or QSP. Implementation and locations of sediment control BMPs are shown on the WPCDs in Attachment C.

The BMP Consideration Checklist in the following table indicates the BMPs that were considered and those that were selected to control sediment on the construction site.

Table 3-3 Consideration Checklist for Sediment Control BMPs

BMP No.	BMP	Considered For Project	Used	Not Used	If not used, state reason
SC-1	Silt Fence	X	X		
SC-2	Sediment Basin	X		X	total rainfall insufficient to require this
SC-3	Sediment Trap	X		X	total rainfall insufficient to require this
SC-4	Check Dam	X			
SC-5	Fiber Rolls	X			
SC-6	Gravel Bag Berm	X			
SC-7	Street Sweeping and Vacuuming				not applicable
SC-8	Sand Bag Barrier	X			
SC-9	Straw Bale Barrier			X	not effective
SC-10	Strom Drain Inlet Protection				None on-site; recommended for off-site locations

Implementation of Temporary Sediment Controls

Temporary sediment control BMPs will be deployed according to the schedule shown in Section 3.4. During the rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas, at the toe of slopes, at storm drain inlets and at outfall areas at all times. During the non-rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas and at storm drain downstream from disturbed areas before rain events. In the event of a predicted storm, the following temporary sediment control materials will be maintained on-site: silt fence, sandbags, and fiber rolls.

3.2.7. Tracking Control

The construction entrances are accessed via the Jamul Indian Village. The following BMPs have been selected to reduce sediment tracking from the construction site on to private or public roads:

- SE-7: Street Sweeping and Vacuuming;
- TC-1: Stabilized Construction Entrance/Exit; and
- TC-2: Stabilized Construction Roadway.

TC-3: Entrance/Outlet Tire Wash was considered, but determined to be unnecessary for this

Street Sweeping and Vacuuming

Road sweeping and vacuuming will occur during soil hauling and as necessary to keep street surfaces clear of soil and debris. Washing of sediment tracked onto streets into storm drains will not occur.

Stabilized Construction Entrance/Exit

A stabilized construction entrance/exit will be constructed and maintained at construction site entrances and exits, and equipment yard, as shown on the site map. Alternatively, rumble plates may be used. The site entrance/exit will be stabilized to reduce tracking of sediment as a result of construction traffic. The entrance will be designated and graded to prevent runoff from leaving the site. Stabilization material may be 3 to 6 inch aggregate. The entrance will be flared where it meets the existing road to provide an adequate turning radius. During dirt-hauling activities that extend over a one-week time period, a site entrance/exit will be installed to reduce tracking of sediment.

Stabilized Construction Roadway

The construction roadway through the site will also be designated and stabilized to prevent erosion and to control tracking of mud and soil material onto adjacent roads. The roadway will be clearly marked for limited speed to control dust. Refer to the WPCDs for entrance/exit and construction roadway locations. Stabilization material may be 3 to 6-inch aggregate. A regular maintenance program will be conducted to replace sediment-clogged stabilization material with new stabilization material.

3.2.8. Wind Erosion Control

The following BMPs have been selected to control dust from the construction site:

- WE-1: Wind Erosion Control;
- NS-1: Water Conservation Practices; and
- WM-3: Stockpile Management.

Dust Control

Potable water will be applied to disturbed soil areas of the project site to control dust and maintain optimum moisture levels for compaction. The water will be applied using water trucks. Water applications will be concentrated during the late summer and early fall months, when soils have the lowest moisture content or when winds are sever. BMPs WE-1: Wind Erosion Control and NS-1: Water Conservation Practices will be implemented to provide dust control and prevent discharges from dust control activities and water supply equipment. Water application rates will be minimized as necessary to prevent runoff and ponding and water equipment leaks will be repaired immediately. During windy conditions (forecast or actual wind conditions of approximately 25 miles per hour or greater), dust control will be applied to disturbed areas, including haul roads, to adequately control wind erosion. BMP WM-3: Stockpile Management will be implemented using silt fences and plastic covers to prevent wind dispersal of sediment from stockpiles.

3.2.9. Non-Storm Water Control

An inventory of construction activities and potential non-storm water discharges was provided in Section 3.2.1. The BMP Consideration Checklist in Table 3-4 indicates the BMPs that were

considered and those that were selected to control non-storm water pollution on the construction site. Implementation and locations of some non-storm water control BMPs are shown on the Water Pollution Control Drawings in Attachment C. A narrative description of each BMP follows.

Table 3-4 Non-Stormwater Control BMPs Consideration Checklist

BMP No.	BMP	Considered For Project	Used	Not Used	If not used, state reason
NS-1	Water Conservation Practices	X	X		
NS-2	Dewatering Operations			X	Not applicable to site
NS-3	Paving and Grinding Operations			X	none allowed
NS-4	Temporary Stream Crossing			X	none allowed
NS-5	Clear Water Diversion			X	none allowed
NS-6	Illicit Connection/ Discharge	X	X		
NS-7	Potable Water/ Irrigation	X	X		
NS-8	Vehicle and Equipment Cleaning			X	none allowed
NS-9	Vehicle and Equipment Fueling	X			none allowed
NS-10	Vehicle and Equipment Maintenance			X	none allowed
NS-11	Pile Driving Operations			X	none allowed
NS-12	Concrete Curing			X	none allowed
NS-13	Concrete Finishing			X	none allowed
NS-14	Material and Equipment Use Over Water			X	none allowed
NS-15	Demolition Adjacent to Water			X	none allowed
NS-16	Temporary Batch Plants			X	none allowed

Illicit Connection/Illegal Discharge Detection and Reporting

The QSP will implement BMP NS-6: Illicit Connection/Illegal Discharge Detection and Reporting throughout the duration of the project.

Vehicle and Equipment Operations

Several types of vehicles and equipment may be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, forklifts, generators, compressors, and traffic control equipment. Vehicle fueling, cleaning, and maintenance is not allowed. Drip pans or absorbent pads will be used for all vehicle and equipment that leaks vehicle fluids.

3.2.10. Waste Management and Materials Pollution Control

An inventory of construction activities, materials, and wastes is provided in Section 3.2.1. The BMP Consideration Checklist in Table 3-5 indicates the BMPs that were considered and those that were selected to control construction site wastes and materials. Implementation and locations of some materials handling and waste management BMPs are shown on the WPCDs in Attachment C. A narrative description of each BMP follows.

Table 3-5 Waste Management and Material Pollution Control BMP Consideration Checklist

BMP No.	BMP	Considered For Project	Used	Not Used	If not used, state reason
WM-1	Material Delivery and Storage	X	X		
WM-2	Material Use	X	X		
WM-3	Stockpile Management	X	X		
WM-4	Spill Prevention and Control	X	X		
WM-5	Solid Waste Management	X	X		
WM-6	Hazardous Waste Management	X	X		
WM-7	Contaminated Soil Management	X	X		
WM-8	Concrete Waste Management	X	X		
WM-9	Sanitary/Septic Waste Management	X	X		
WM-10	Liquid Waste Management	X	X		

Material Delivery, Storage, and Use

In general, BMPs WM-1 and WM-2 will be implemented to help prevent discharges of construction materials during delivery, storage, and use. A sandbag barrier (BMP SE-8) will be provided around the storage area to prevent run-on from adjacent areas. Watertight shipping containers will be used to store hand tools, small parts, and most construction materials that can be carried by hand, such as paint cans, solvents and grease. Very large items, such as light standards, framing materials, and stockpiled lumber, will be stored in the open in the general storage area. Such materials will be elevated with wood blocks to minimize contact with run-on. Spill clean-up materials, material safety data sheets, a material inventory, and emergency contact numbers will be maintained and stored in the southern shipping container.

Stockpile Management

BMP WM-3: Stockpile Management, will be implemented to reduce or eliminate pollution of storm water from stockpiles of soil and paving materials such as PCC rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate subbase, pre-mixed aggregate, and asphalt minder (so called “cold mix” asphalt). Stockpiles will be surrounded with sediment controls (SE-5: Fiber Rolls or SE-8: Sandbag Barrier). Plastic covers (EC-7: Geotextiles & Mats), or EC-5: Soil Binders, will be used.

Spill Prevention and Control

BMP WM-4: Spill Prevention and Control, will be implemented to contain and clean-up spills and prevent material discharges to the storm drain system. Spill prevention is also discussed above under Material Delivery, Storage, and Use and below under Waste Management.

Waste Management

BMP WM-5: Solid Waste Management and BMP WM-6: Hazardous Waste Management will be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes will be loaded directly into trucks or roll-off dumpsters for off-site disposal. When on-site storage is necessary, solid wastes will be stored in watertight dumpsters in the general storage area of the contractor’s yard. AC and PCC rubble will be stockpiled in the general storage area and will be surrounded with sediment controls (SE-8: Sandbag Barrier) and covered when necessary. Solid waste, including rubble stockpiles, will be removed and disposed off-site at least weekly. A licensed subcontractor will provide solid waste disposal services. Hazardous wastes will be stored in the shipping containers or covered containment area discussed above for materials storage. Hazardous wastes will be appropriately and clearly marked in containers and segregated from other non-waste materials.

Contaminated Soil Management

When contaminated soils are encountered, the applicable regulatory agency will be notified, the contaminated soils will be contained, covered if stockpiled, and disposed of per WM-7: Contaminated Soil Management, and the contract documents. Employees will be instructed to recognize evidence of contaminated soil, such as buried debris, discolored soil, and unusual odors.

Concrete Residuals and Washout Wastes

BMP WM-8: Concrete Waste Management will be implemented and a pre-made bin or below grade concrete washout facility will be constructed and maintained at the contractor's yard. All excess concrete and concrete washout slurries will be discharged to the washout facility for drying. BMP maintenance, waste disposal, and BMP removal will be conducted as described in WM-8. Dried-out concrete may be used as fill material if permitted. Concrete waste solids/liquids will be removed and disposed of as required by WM-8. Concrete pours will not be conducted during or immediately prior to rainfall events.

Sanitary and Septic Wastes

The QSP will implement BMP WM-9: Sanitary and Septic Waste Management and portable toilets will be located and maintained at the contractor's yard for the duration of the project. Weekly maintenance will be provided by a licensed subcontractor and wastes will be disposed off-site. The toilets will be located away from concentrated flow paths and traffic flow.

3.3. Rain Event Action Plan

A Rain Event Action Plan is not required for Risk Level 1 projects.

3.4. Construction BMP Maintenance, Inspection, and Repair

All inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a QSP representing the Legally Responsible Person. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

3.4.11. Implementation of Erosion Control BMPs

BMPs will be deployed in a sequence to follow the progress of grading and construction. As the locations of soil disturbance change, erosion and sedimentation controls will be adjusted accordingly to control storm water runoff at the downgrade perimeter and drain inlets. BMPs will be mobilized as follows:

- Year-round:
    - The QSP will monitor weather using National Weather Service reports to track conditions and alert crews to the onset of rainfall events.
    - Disturbed soil areas will be stabilized with temporary erosion control or with permanent erosion control as soon as possible after grading or construction is complete.
- During the rainy season:
    - Disturbed areas will be stabilized with temporary or permanent erosion control before rain events.
    - Disturbed areas that are substantially complete will be stabilized with permanent erosion control (soil stabilization) and vegetation (if within seeding window for seed establishment).
    - Prior to forecast storm events, temporary erosion control BMPs will be deployed and inspected.
- During the non-rainy season:
    - The project schedule will sequence construction activities with the installation of both erosion control and sediment control measures. The construction schedule

will be arranged as much as practicable to leave existing vegetation undisturbed until immediately prior to grading.

Sufficient quantities of temporary sediment control materials will be maintained on-site throughout the duration of the project, to allow implementation of temporary sediment controls in the event of predicted rain, and for rapid response to failures or emergencies, in conformance with other Permit requirements and as described in this SWPPP. This includes implementation requirements for active areas and non-active areas before the onset of rain.

The QSP shall use the guidelines in Table 3-6 for maintenance, inspection, and repair of BMPs identified in the SWPPP.

Table 3-6 Program for Maintenance, Inspection and Repair of BMPs

BMPs	INSPECTION FREQUENCY (all controls)	MAINTENANCE/REPAIR PROGRAM
Soil Stabilization, Grade Surfaces	Weekly and after each storm	Regrade and reapply seed, straw or tack as necessary.
Earth Berms	Weekly and after each storm	Regrade earth berm as identified in project plans.
Inlet Protection	Weekly and after each storm	Replace fabric-wrapped concrete blocks and sandbags as necessary.
Stabilized Construction Entrance	Weekly and after each storm	Replace gravel material as necessary and remove and sediment deposited on roadway within 24 hours.
Temporary Sediment Retention Facilities	Weekly and after each storm	Inspect retention facilities for sediment buildup. Sediment shall be excavated as necessary.
Temporary Stockpile Area, Silt Fence	Weekly and after each storm	Replace plastic covers or torn sections of silt fence and clear as necessary.
Dust Control	At least daily	Maintain sufficient watering devices on site.

3.5. Spill Prevention Control and Countermeasure Plan

The spill prevention and control plan for the project will include the following components.

- Maintenance of spill kit for petroleum hydrocarbons on site in the supervisor's vehicle and in fuel supply trucks to include:
  - Containment drum;
  - Oleophilic absorbent pads; and
  - Granular spill absorbent suitable for petroleum, brake fluid and antifreeze;
- Daily inspection of construction equipment for oil and fuel leaks;
- Fueling in the designated area at or near the material lay-down area; and
- Training of personnel on handling of leaks (training at tailgate safety meetings).

3.6. Post-Construction Storm Water Management

3.6.1. Post-Construction Control Practices

The following are the post-construction BMPs that are to be used at this construction site after all construction is complete:

- After the temporary use period, all vehicles and construction materials would be removed; then the mulch and construction fabric would be carefully removed. Then, a habitat restoration / enhancement plan would then be implemented to return the temporary use area to a condition better than the existing condition. The habitat restoration / enhancement plan includes removal of invasive species, aeration of the soil where compacted, and the planting and irrigation of native plants to re-establish native grassland habitats.

3.6.2. Operation/Maintenance after Project Completion

The post-construction BMPs that are described above will be funded and maintained by the Jamul Indian Village or their designated contractors.

3.7. Training

A copy of the SWPPP will be made available to the designated SWPPP inspector and will be made available to the subcontractor representatives engaged in the maintenance or installation of BMPs. Site inspectors observing improper construction measures or pollution caused by ineffective construction practices will inform site personnel of appropriate and proper Erosion and Sedimentation Control Practices, along with special follow-up inspection for further training. The QSP or general contractor shall organize orientation sessions with all installation, inspection and maintenance personnel upon initiation of a specific construction activity or change in key personnel. These sessions will be setup to insure that all contractor and sub-contractor operations are implemented in accordance with this SWPPP. Training sessions will be included as part of weekly safety meetings to familiarize works with the requirements of the SWPPP. The training log showing formal and informal training of various personnel is shown in Attachment F.

3.8. List of Subcontractors

All contractors and subcontractors will be notified of the requirement for storm water management measures during the project. A list of contractors will be maintained and included in the SWPPP. If subcontractors change during the project, the list will be updated accordingly. The subcontractor notification letter and log is included in the SWPPP as Attachment G.

4.0 CONSTRUCTION SITE MONITORING PROGRAM

4.1. Objectives

The Construction Site Monitoring Program shall be developed and implemented to address the following objectives:

- To demonstrate that the site is in compliance with the Discharge Prohibitions;
- To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;
- To determine whether immediate corrective actions, additional BMP implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and
- To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

4.2. Types of Inspections and Frequency

Based on the project site's location, construction period, and rainfall erosivity factor, this project shall comply with the monitoring program for Risk Level 1 projects as summarized in the following table. Each inspection event will be logged in the Inspection Log in Attachment H.

Table 4-1 Summary of Risk Level 1 Monitoring Program

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

4.2.1. Exceptions

The QSP shall be prepared to collect samples and conduct visual inspections until the minimum requirements of the Construction General Permit are met. QSPs are not required to physically collect samples or conduct visual inspections under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms; and
- Outside of scheduled site business hours.

If no required samples or visual inspections are collected due to these exceptions, QSPs shall include an explanation in their SWPPP and in the Annual Report documenting why the sampling or visual inspections were not conducted.

4.2.2. Inspection and Sampling Personnel

All inspection, maintenance repair, and sampling activities shall be performed by the QSP. The QSP may designate and train personnel to perform inspections and to collect and ship

water samples. The name(s) and contact number(s) of the assigned inspection and sampling personnel are listed in Section 1.4.

4.3. Non-Compliance Reporting

Risk Level 1 projects do not require immediate non-compliance reporting. The records of any corrective actions and follow-up activities that result from analytical results, visual observation (inspections), or inspections must be logged and included in the Annual Report.

The Corrective Action Log is found in Attachment I.

If a discharge occurs or if the project receives a written notice of non-compliance, QSP will immediately notify the Legally Responsible Person and will file a written report to the RWQCB within 30 days of the identification of non-compliance. Corrective measures will be implemented immediately following the discharge, notice, or order. The report to the RWQCB will contain the following items:

- The date, time, location, nature of operation, and type of unauthorized discharge, including the cause or nature of the notice or order;
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order, The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence;
- An implementation and maintenance schedule for any affected BMPs; and
- Any necessary amendments to the SWPPP.

4.4. Record Keeping and Reports

The Legally Responsible Person or QSP shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. The QSP shall retain all records on-site while construction is ongoing. Each inspection event will be logged in the Inspection Log in Attachment H. These records include:

- The date, place, time of facility inspections, sampling, visual inspections, and/or measurements, including precipitation;
- The individual(s) who performed the facility inspections, sampling, visual inspections, and or measurements;
- The date and approximate time of analyses;
- The individual(s) who performed the analyses;
- A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- Quality assurance/quality control records and results;
- Non-storm water discharge inspections and visual inspections and storm water discharge visual observation records;
- Visual observation and sample collection exception records; and
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual inspections, or inspections.

Any sampling events will be logged in the Sampling Activity Log provided in Attachment J.

4.5. Visual Inspection Plan

4.5.3. Risk Level 1 Visual Inspection Requirements for Qualifying Rain Events

The QSP shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event. The QSP shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours. The QSP shall conduct visual observations (inspections) during business hours only. The QSP shall record the time, date and rain gauge reading of all qualifying rain events. Within 2 business days (48 hours) prior to each qualifying rain event, the QSP shall visually observe (inspect):

- All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources (if needed, the QSP shall implement appropriate corrective actions);
- All BMPs to identify whether they have been properly implemented in accordance with the SWPPP (if needed, the QSP shall implement appropriate corrective actions); and
- Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

For the visual inspections described above, the QSP shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants. Within two business days (48 hours) after each qualifying rain event, the QSP shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

The QSP shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4.5.4. Risk Level 1 Non-Storm Water Discharge Monitoring Requirements

The following visual monitoring requirements apply to the project:

- The QSP shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.
- The QSP shall conduct one visual inspection quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual inspections are only required during daylight hours (sunrise to sunset).
- The QSP shall ensure that visual inspections document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. The QSP shall maintain on-site records indicating the personnel performing the visual inspections, the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

4.6. Effluent Standards and Monitoring

4.6.4.1. Effluent Standards for Risk Level 1

The QSP shall comply with the narrative effluent standards listed below:

- Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges; and
- The QSP shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

Risk Level 1 projects are not subject to a numeric effluent standard.

4.6.5. Effluent Monitoring Requirements

The QSP must analyze one or more effluent samples for any parameters indicating the presence of pollutants during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water. Samples of discharge will be collected at the designated sampling locations shown on the WPCDs for observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

4.6.6. Effluent Sampling Locations

Effluent shall be sampled at all discharge points where storm water and/or authorized non-storm water is discharged off-site. Sampling locations are shown in the WPCDs in Attachment C.

4.7. Monitoring Plan for Sediment

If the project has the potential to discharge directly into a water body listed as impaired due to sedimentation/siltation and/or turbidity pursuant to Section 303(d) of the Clean Water Act, the SWPPP must include a Sampling and Analysis Plan (SAP) for sediment. The State Water Resource control Board web site at http://www.swrcb.ca.gov/tmdl/303d_lists.html lists all 303(d) impaired water bodies in California.

This project does not have the potential to discharge directly to a water body listed as impaired due to sedimentation/siltation and/or turbidity pursuant to Clean Water Act, Section 303(d). If sediment is discharged from the site during rain events, sampling for sediment or turbidity will be performed according to the procedures in Table 4-1.

4.8. Monitoring Plan for Non-Visible Pollutants

4.8.7. Risk Level 1 – Non-Visible Pollutant Monitoring Requirements

The QSP shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface

waters that would not be visually detectable in storm water. The QSP shall ensure that water samples are large enough to characterize the site conditions. The QSP shall collect samples at all discharge locations that can be safely accessed. The QSP shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff. The QSP shall analyze samples for all applicable non-visible pollutant parameters. The QSP shall modify the Construction Site Monitoring Program to address these additional parameters in accordance with any updated SWPPP pollutant source assessment. The QSP shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample. The QSP shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis. The QSP shall keep all field /or analytical data in the SWPPP document. Samples will be analyzed for the applicable constituents using the analytical methods identified in the following Table 4-2.

Table 4-2 Sample Collection, Preservation and Analysis for Monitoring Sedimentation, Siltation, and/or Turbidity

Constituent [1]	Analytical Method	Test to be Used?	Sample Preservation	Minimum Sample Volume	Sample Bottle	Maximum Holding Time	Reporting Limit
(a) Suspended Sediment Concentration (SSC)	ASTM D3977-97	☐ YES ☐ NO	Store at 4° C (39.2° F)				
(b) Settleable Solids (SS)	EPA 160.5 Std Method 2540(f)	☐ YES ☐ NO	Store at 4° C (39.2° F)				mL/L/hr
(c) Total Suspended Solids (TSS)	EPA 160.2 Std Method 2540(d)	☐ YES ☐ NO	Store at 4° C (39.2° F)				mg/L
(d) Turbidity	EPA 180.1 Std Method 2130(b)	☐ YES ☐ NO	Store at 4° C (39.2° F)				NTU

Notes: [1] Samples shall be analyzed by using methods (b) and (c), or only method (a)

ASTM – American Society for Testing and Materials
°C – Degrees Celsius
°F – Degrees Fahrenheit
EPA – U.S. Environmental Protection Agency
L – Liter
mL/L/hr – Milliliters per liter per hour
mg/L – Milligrams per liter
mL – Milliliters
NTU – Nephelometric Turbidity Unit
Std Method – Per the *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, American Water Works Association

4.9. General Sampling Methodology

4.9.1. Sample Collection and Delivery

The QSP shall designate and train personnel to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's 2008 Quality Assurance Program Plan. The QSP shall ensure that testing laboratories will receive samples within 48 hours of the physical sampling (unless otherwise required by the laboratory), and shall use only the sample containers provided by the laboratory to collect and store samples.

The QSP shall ensure that all sampling and sample preservation are in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association). All monitoring instruments and equipment (including a discharger's own field instruments for measuring pH and turbidity) should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements. The QSP shall ensure that all laboratory analyses are conducted according to test procedures under 40 Code of Federal Regulations Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Board. With the exception of field analysis conducted by the QSP for turbidity and pH, all analyses should be sent to and conducted at a laboratory certified for such analyses by the State Department of Health Services. The QSP may conduct his or her own field analysis of pH and turbidity if the discharger has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to adequately perform the field analyses.

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool-temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, surgical gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, Sampling Activity Log forms, and Chain of Custody (COC) forms. The QSP will obtain and maintain the field-testing instruments for analyzing samples in the field by trained sampling personnel. Safety practices for sample collection will be in accordance with the site health and safety plan. The QSP or his or her delegate will contact the project's selected laboratory at least 8 hours prior to a predicted rain event and if one of the triggering conditions is identified during an inspection before, during, or after a storm event to ensure that adequate sample collection personnel, supplies and field test equipment for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

Grab samples will be collected and preserved in accordance with the applicable test method. Only personnel trained in proper water quality sampling will collect samples. Samples will be collected by placing a separate lab-provided sample container directly into a stream of water down gradient and within close proximity to the potential non-visible pollutant discharge location. This separate lab-provided sample container will be used to collect water, which will be transferred to sample bottles for laboratory analysis. The up gradient and uncontaminated background samples shall be collected first prior to collecting the down gradient to minimize

cross-contamination. The sampling personnel will collect the water upgradient of where they are standing. Once the separate lab-provided sample container is filled, the water sample will be poured directly into sample bottles provided by the laboratory for the analyte(s) being monitored. To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location;
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample;
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection;
- Not leave the cooler lid open for an extended period of time once samples are placed inside;
- Not sample near a running vehicle where exhaust fumes may impact the sample;
- Not touch the exposed end of a sampling tube, if applicable;
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles;
- Not eat, smoke, or drink during sample collection;
- Not sneeze or cough in the direction of an open sample bottle;
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample to take place;
- Decontaminate sampling equipment prior to sample collection using a laboratory-grade soapy water wash, distilled water rinse, and final rinse with distilled water; and
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.
-

Immediately following collection, samples for field analysis will be tested in accordance with the field instrument manufacturer's instructions and results recorded on the Sampling Activity Log. Immediately following collection, sample bottles for laboratory analytical testing will be capped, labeled, documented on a COC form provided by the analytical laboratory, sealed in a re-sealable storage bag, placed in an ice-chilled cooler, at as near to 4 degrees Celsius as practicable, and delivered within 24 hours to one of the following California state-certified laboratories (or another certified laboratory):

- Analytical Chemical Labs, Inc., 1123 West Morena Boulevard, San Diego, CA 92110-3853, (619) 276-1558
- EMSL Analytical Inc., 7916 Convoy Court, San Diego, CA 92111, (858) 499-1302
- Enviromatrix Analytical, Inc., 4340 Viewridge Avenue., Suite A, San Diego, CA 92123, (858) 560-7717
- Environmental Engineering Laboratory, Inc, 3538 Hancock Street, San Diego, CA 92110, (619) 298-6131
- JMR Environmental Services, Inc., 4560 Alvarado Canyon Road, Suite 2D, San Diego, CA 92120, (619) 858-7260
- Nautilus Environmental, LLC, 4340 Vandever Avenue, San Diego, CA 92120, (858) 587-7333
- Pacific Chemical Labs, Inc, 905 South 33rd Street, San Diego, CA 92113, (619) 218-4191
- Ultimate Labs Inc, 5940 Pacific Mesa Court #209/210, San Diego, CA 92121, (858) 677-9297

- UMB Analytical, Inc, 6153 Fairmount Ave, Suite 104, San Diego, CA 92120, (619) 501-7698

All original data documented on sample bottle identification labels, COC forms, Sampling Activity Logs, and Inspection Checklists will be recorded using waterproof ink. These will be considered accountable documents. If an error is made on an accountable document, the individual will make corrections by lining through the error and entering the correct information. The erroneous information will not be obliterated. All corrections will be initialed and dated. All sampling events will be logged in the Sampling Activity Log provided in Attachment J. Sampling and field analysis activities will be documented using the following:

- Sample Bottle Identification Labels: Sampling personnel will attach an identification label to each sample bottle. At a minimum, the following information will be recorded on the label, as appropriate:
    - Project name
    - Project number
    - Unique sample identification number and location.
    - Quality assurance/quality control (QA/QC) samples shall be identified similarly using a unique sample number or designation
    - Collection date/time
    - Analysis constituent
- Sampling Activity Logs: A log of sampling events will identify:
    - Sampling date
    - Separate times for collected samples and QA/QC samples recorded to the nearest minute
    - Unique sample identification number and location
    - Analysis constituent
    - Names of sampling personnel
    - Weather conditions (including precipitation amount)
    - Field analysis results
    - Other pertinent data
- COC forms: All samples to be analyzed by a laboratory will be accompanied by a COC form provided by the laboratory. Only the sample collectors will sign the COC form over to the lab. COC procedures will be strictly adhered to for QA/QC purposes.
- Storm Water Quality Construction Inspection Checklists: When applicable, the QSP or qualified storm water inspector will document on the checklist that samples for nonvisible pollutants were taken during a rain event.

4.9.2. Quality Assurance/Quality Control

For an initial verification of laboratory or field analysis, duplicate samples will be collected at a rate of 10 percent or 1 duplicate per sampling event. The duplicate sample will be collected, handled, and analyzed using the same protocols as primary samples. A duplicate sample will be collected at each location immediately after the primary sample has been collected. Duplicates will be collected where contamination is likely, not on the background sample. Duplicate samples will not influence any evaluations or conclusions; however, they will be used as a check on laboratory quality assurance.

4.9.3. Data Evaluation

An evaluation of the water quality sample analytical results, including figures with sample locations, will be prepared by the QSP with the water quality analytical results and the QA/QC data. Should the sample show an increased level of the tested analyte relative to any background sample or value, the BMPs, site conditions, and surrounding influences will be assessed to determine the probable cause for the increase. As determined by the site and data evaluation, appropriate BMPs will be repaired or modified to mitigate discharges of non-visual pollutant concentrations. Any major revisions to the BMPs will be recorded as an amendment to the SWPPP.

4.10. Change of Conditions

Whenever SWPPP monitoring, pursuant to the Construction General Permit, indicates a change in site conditions that might affect the appropriateness of sampling locations or introduce additional non-visible pollutants of concern, testing protocols will be revised accordingly. All such revisions will be recorded as amendments to the SWPPP.

5.0 CONDITIONS FOR TERMINATION OF PERMIT COVERAGE

Within 90 days of when construction is complete or ownership has been transferred, the Legally Responsible Person or QSP shall electronically file a Notice of Termination (NOT), a final site map, and photos through the SWRCB's SMARTS system. Filing a NOT certifies that all Construction General Permit requirements have been met. The RWQCB will consider a construction site complete only when all portions of the site have been transferred to a new owner, or all of the following conditions have been met:

- For purposes of "final stabilization," the site will not pose any additional sediment discharge risk than it did prior to the commencement of construction activity;
- There is no potential for construction-related storm water pollutants to be discharged into site runoff;
- Final stabilization has been reached;
- Construction materials and wastes have been disposed of properly;
- Compliance with the Post-Construction Standards in Section XIII of the Construction General Permit has been demonstrated;
- Post-construction storm water management measures have been installed and a long-term maintenance plan has been established;
- All construction-related equipment, materials and any temporary BMPs no longer needed are removed from the site;
- The discharger shall certify that final stabilization conditions are satisfied in their NOT. Failure to certify shall result in continuation of permit coverage and annual billing; and
- The NOT must demonstrate through photos, RUSLE or RUSLE2, or results of testing and analysis that the site meets all of the conditions above and the final stabilization condition is attained by one of the following methods:
  - "70% final cover method," no computational proof required; or
  - "RUSLE or RUSLE2 method," computational proof required; or
  - "Custom method," the discharger shall demonstrate in some manner other than the above that the site complies with the "final stabilization" requirement.

Attachment K will contain the final NOT package.

6.0 REFERENCES

CASQA. 2009. California Stormwater Best Management Practice Handbook – Construction. Available from: http://www.cabmphandbooks.com.

Goldman S.J., K. Jackson, and T.A. Bursztynsky. 1986. Erosion and Sediment Control Handbook. McGraw Hill. San Francisco.

Renard, K.C., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder. 1997. Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE), Agricultural Handbook 703, USDA-ARS, U.S. Government Printing Office, Washington, D.C.

State Water Resources Control Board. 2009. National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities Order No. 2009-0009-DWQ, NPDES No. CAS000002.

United States Department of Agriculture. Hanford Series. 1999. National Cooperative Soil Survey. Available from: http://www2.ftw.nrcs.usda.gov/osd/dat/ H/HANFORD.html [cited 18 Apr 2009]

Attachment A: Notice of Intent, Site Calculations, and Risk Level Determination

2.2.1. Risk Level Calculation

The site's sediment risk and receiving water risk must be calculated during periods of soil exposure (i.e. grading and site stabilization), and then used to determine a Risk Level(s) using the methodology in Appendix 1 of the Construction General Permit. The site's Risk Level determination must be included in the Permit Registration Documents.

Step 1: Determine Sediment Risk

The Watershed Erosion Rate Estimate must be calculated (in tons/acre); the formula is R x K x LS, where:

- R is the rainfall erosivity factor;
- K is the soil-erodibility factor; and
- LS combines the effects of a hillslope length factor, L, and a hillslope-gradient factor, S

The project site's R Factor Value was calculated using the United States Environmental Protection Agency's (USEPA) Rainfall Erosivity Factor Calculator (http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm), and the following inputs:

- start date (date of initial earth disturbance): December 1, 2014
- end date (date of final site stabilization): December, 2016
- site coordinates of Latitude: 32.703775° N and Longitude: 116.871424° W

The project site's R Factor Value is: 85.61.

The project site's K Factor value was determined by the SWRCB's RUSLE K FACTOR Map = 0.16

LS was calculated using Table 3.1 in Renard et. al. (1997) and the following inputs:

- Sheet flow length (feet) = 1,000
- Average watershed slope (%) = 2%

Thus, the LS Factor = 0.69.

Thus, the Watershed Erosion Estimate (R x K x LS) for the project site is: 85.61 x 0.16 x 0.69 = 9.45 tons/acre.

The Site Sediment Risk Factor is determined by the magnitude of the Watershed Erosion Estimate, according to the following criteria:

- Low Sediment Risk: < 15 tons/acre
- Medium Sediment Risk: >/=15 tons/acre and < 75 tons/acre
- High Sediment Risk: > 75 tons/acre

Thus, the Site Sediment Risk Factor for the project site is: LOW

Step 2: Determine Receiving Water Risk

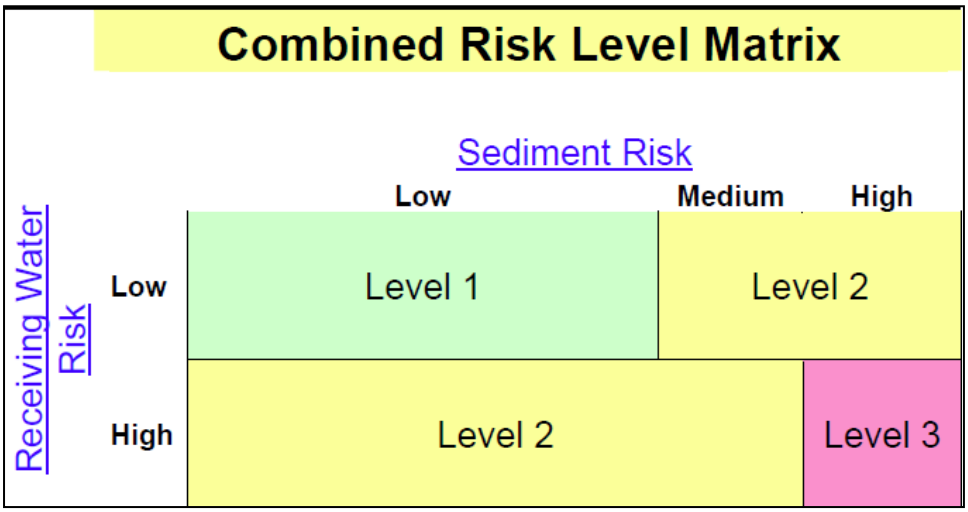
The Receiving Water Risk Factor is "HIGH" if either of the following is true for the project site:

- The disturbed area discharges (either directly or indirectly) to a 303(d)-listed waterbody impaired by sediment, or that has a USEPA-approved total maximum daily load implementation plan for sediment.
  (Impaired waterbodies listed on the Internet at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml); or
- The disturbed area discharges to a waterbody with designated beneficial uses of "SPAWN" and "COLD" and "MIGRATORY" (geographic information system method, online map at http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp)

The project site does not discharge directly or indirectly to an impaired waterbody or a waterbody designated with special uses. The Receiving Water Risk Factor is: Low.

Step 3: Determine Combined Risk Level

The calculated site sediment risk and receiving water risk are combined in the following matrix to determine the Risk Level:



The Sediment Risk Level for this project is Low and the Receiving Water Risk Level is Low, thus the Risk Level for this project is Risk Level 1. Attachment A contains the support documentation and calculations for the risk level determination for this project.

	Average Watershed Slope (%)																		
Sheet Flow Length (ft)	**0.2**	**0.5**	**1.0**	**2.0**	**3.0**	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**20.0**	**25.0**	**30.0**	**40.0**	**50.0**	**60.0**
<3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.92	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15

LS Factors for Construction Sites. *Table 3.1 from Renard et. al., 1997.*

United States Environmental Protection Agency

Water: Stormwater

LEW Results

Rainfall Erosivity Factor Calculator for Small Construction Sites

Facility Information

Start Date:	12/01/2014
End Date:	12/01/2016
Latitude:	32.7038
Longitude:	-116.8714

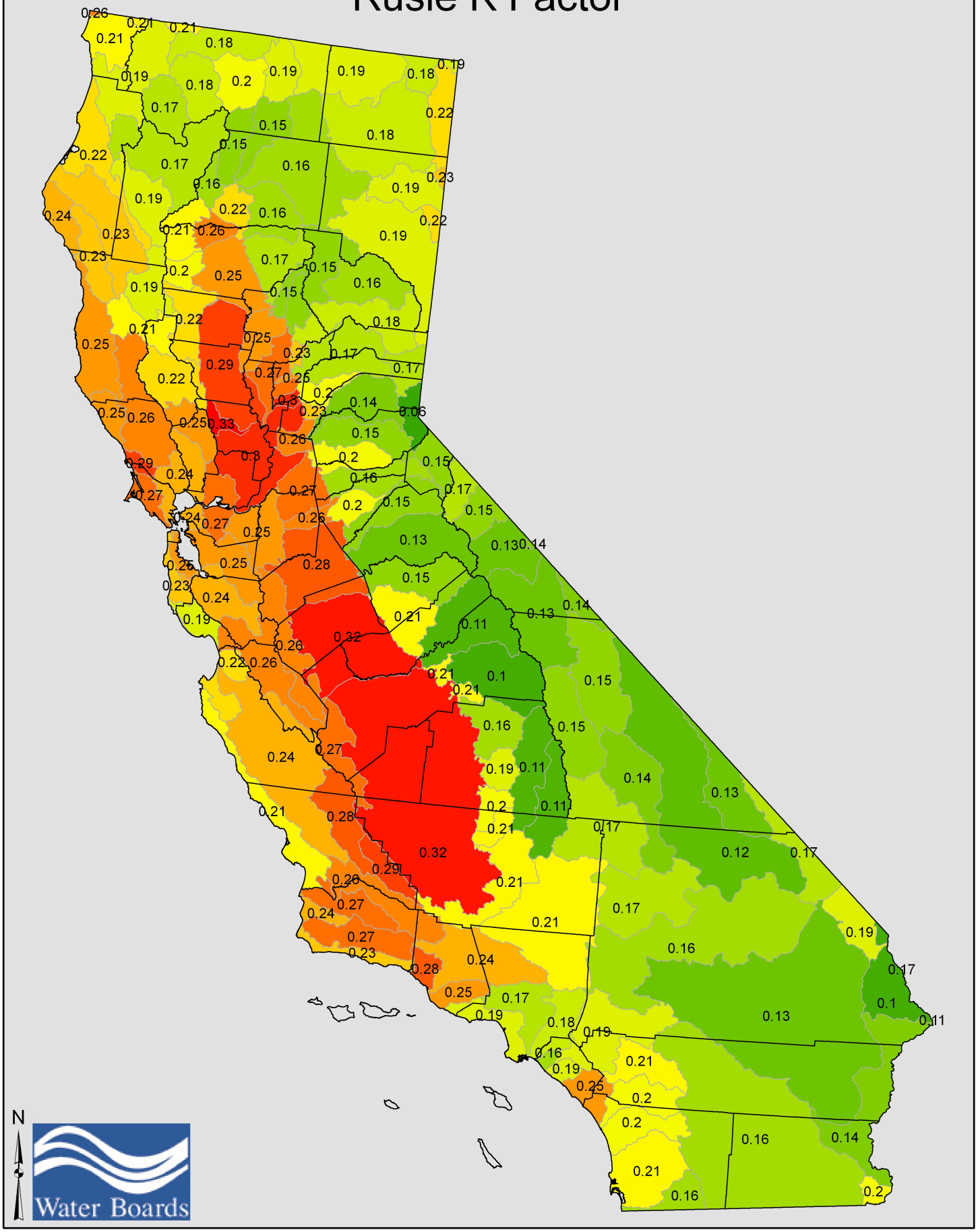
Erosivity Index Calculator Results

AN EROSIVITY INDEX VALUE OF **85.61** HAS BEEN DETERMINED FOR THE CONSTRUCTION PERIOD OF **12/01/2014** - **12/01/2016**.

A rainfall erosivity factor of 5.0 or greater has been calculated for your site and period of construction. **You do NOT qualify for a waiver from NPDES permitting requirements**.

Start Over

Rusle K Factor



Attachment B: SWPPP Amendments

Amendment Log

Amendment No.	Date	Brief Description of Amendment	Prepared By

Attachment C: Site Layout, Project Plans, and Water Pollution Control Drawings (WPCDs)

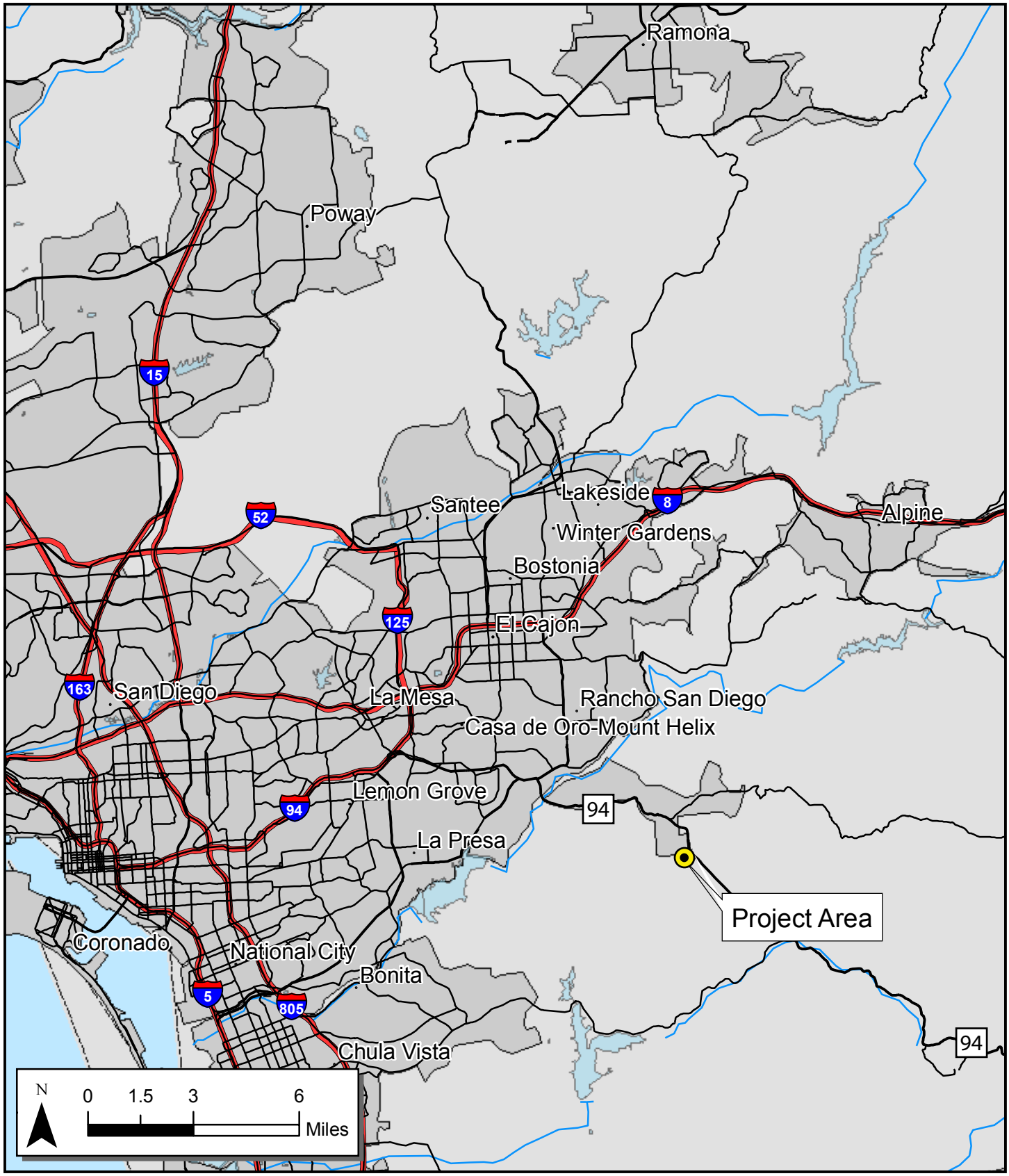


Figure 1. Location of the Project Area

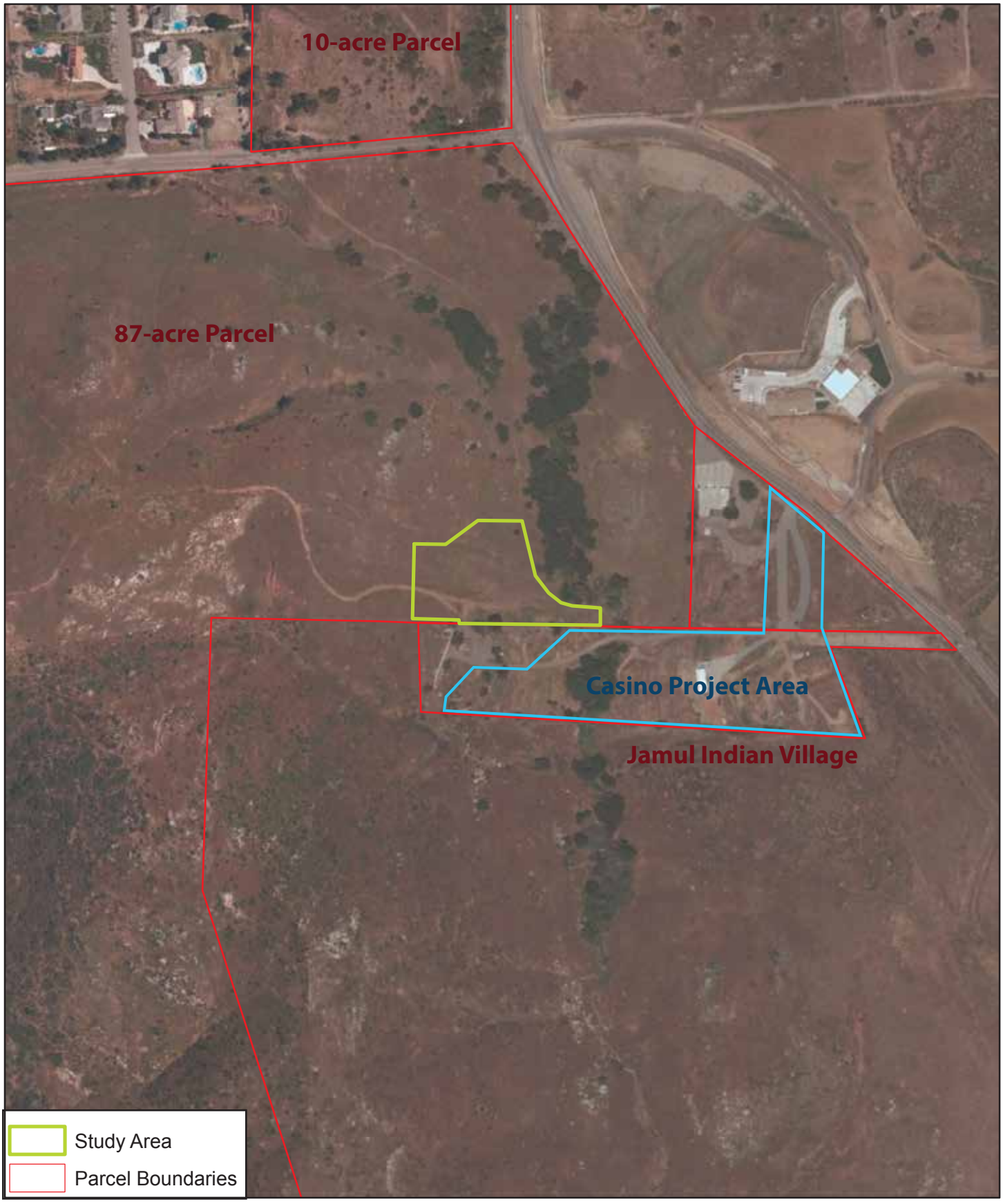
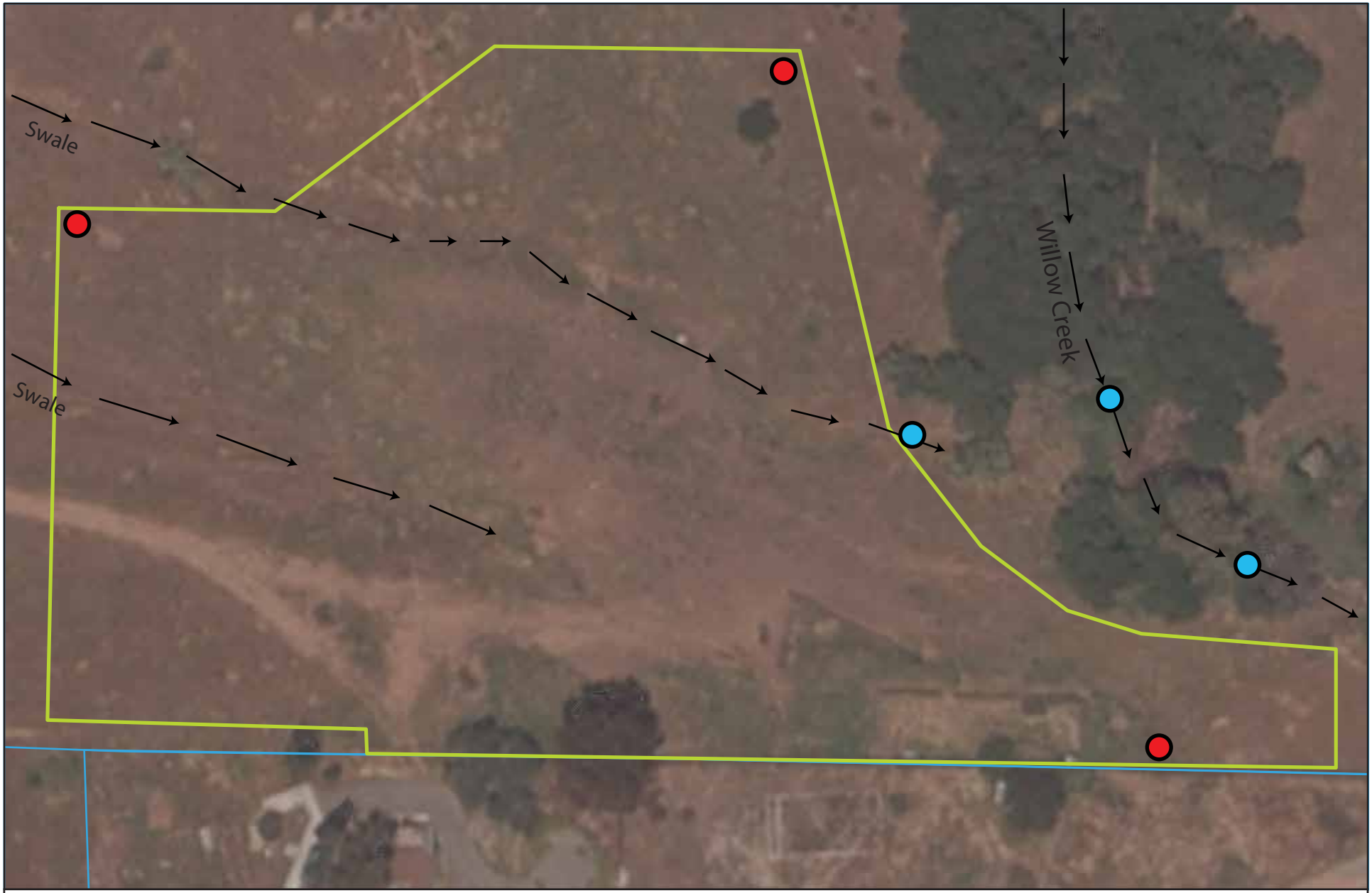


Figure 2
Location of Addendum Project Area in Relation to Adjacent Properties


Swale
SE-4: Check Dams
(or cobble fill)
Swale
SE-4: Check Dams
(or cobble fill)
SE-5: Fiber Rolls
(or SE-1: Silt Fence)
SE-6, SE-8
Sandbag
and/or Gravel
Barrier
Willow Creek
SE-5: Fiber Rolls
(or SE-1: Silt Fence)
0
40
80
120
160
Feet
Parcel Boundaries
Temp. Use Area
Cobble / rip-rap
Straw Fiber Roll
Flow Path

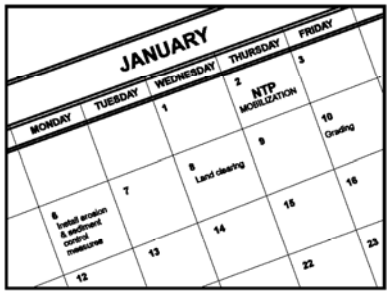
NATURAL INVESTIGATIONS COMPANY

Water Pollution Control Drawings


Swale
Swale
Willow Creek
0
40
80
120
160
Feet
Parcel Boundaries
Temp. Use Area
Spill Clean-up Kit
Water Quality Sampling Point
Flow Path

Attachment D: Annual Reports

Attachment E: Fact Sheets of Selected BMPs



Objectives

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.
- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

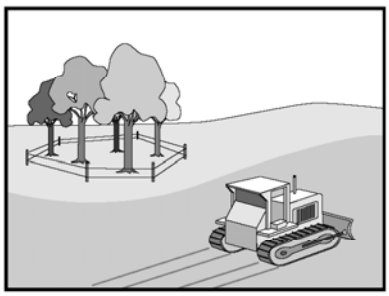
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Objectives

EC	Erosion Control	☑
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TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

EC-2 Preservation Of Existing Vegetation

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Preservation Of Existing Vegetation EC-2

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

EC-2 Preservation Of Existing Vegetation

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.
- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

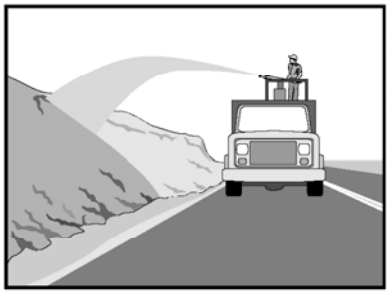
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch EC-3



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching

Description and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

Suitable Applications

Hydraulic mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

Wood fiber hydraulic mulches are generally short lived and need 24 hours to dry before rainfall occurs to be effective. May require a second application in order to remain effective for an entire rainy season.

Implementation

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- To be effective, hydraulic matrices require 24 hours to dry before rainfall occurs.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Paper based hydraulic mulches alone shall not be used for erosion control.

Hydraulic Mulches

Wood fiber mulch can be applied alone or as a component of hydraulic matrices. Wood fiber applied alone is typically applied at the rate of 2,000 to 4,000 lb/acre. Wood fiber mulch is manufactured from wood or wood waste from lumber mills or from urban sources.

Hydraulic Matrices

Hydraulic matrices include a mixture of wood fiber and acrylic polymer or other tackifier as binder. Apply as a liquid slurry using a hydraulic application machine (i.e., hydro seeder) at the following minimum rates, or as specified by the manufacturer to achieve complete coverage of the target area: 2,000 to 4,000 lb/acre wood fiber mulch, and 5 to 10% (by weight) of tackifier (acrylic copolymer, guar, psyllium, etc.)

Bonded Fiber Matrix

Bonded fiber matrix (BFM) is a hydraulically applied system of fibers and adhesives that upon drying forms an erosion resistant blanket that promotes vegetation, and prevents soil erosion. BFMs are typically applied at rates from 3,000 lb/acre to 4,000 lb/acre based on the manufacturer's recommendation. A biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM should also be biodegradable and should not dissolve or disperse upon re-wetting. Typically, biodegradable BFMs should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Costs

Average cost for installation of wood fiber mulch is $900/acre. Average cost for installation of BFM is $5,500/acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

References

Controlling Erosion of Construction Sites Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

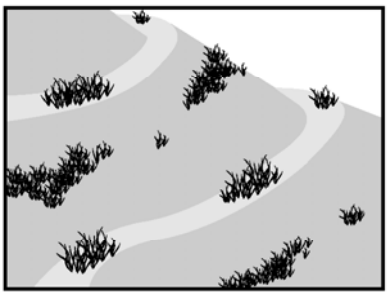
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-5 Soil Binders
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, to temporarily protect exposed soils from erosion by water and wind.

Suitable Applications

Hydroseeding is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short term inactivity.

Implementation

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps shall be followed for implementation:

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Hydroseeding can be accomplished using a multiple step or one step process. The multiple step process ensures maximum direct contact of the seeds to soil. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the area to be seeded with the furrows trending along the contours.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.
- Follow up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average cost for installation and maintenance may vary from as low as $300 per acre for flat slopes and stable soils, to $1600 per acre for moderate to steep slopes and/or erosive soils.

Hydroseeding		Installed Cost per Acre
High Density	Ornamentals	$400 - $1600
	Turf Species	$350
	Bunch Grasses	$300 - $1300
Fast Growing	Annual	$350 - $650
	Perennial	$300 - $800
Non-Competing	Native	$300 - $1600
	Non-Native	$400 - $500
Sterile	Cereal Grain	$500

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

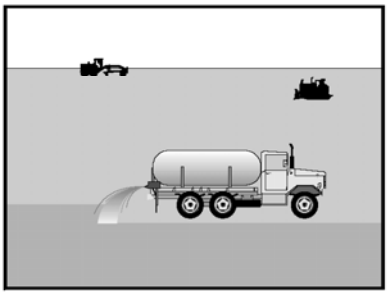
Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems shall be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-6 Straw Mulch
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

Description and Purpose

Soil binders consist of applying and maintaining a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water induced erosion of exposed soils on construction sites. Soil binders also prevent wind erosion.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring short term temporary protection. Because soil binders can often be incorporated into the work, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are also suitable for use on stockpiles.

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

- Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.
- A sampling and analysis plan must be incorporated into the SWPPP as soil binders could be a source of non-visible pollutants.

Implementation

General Considerations

- Regional soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater.
- Some soil binders may not be compatible with existing vegetation.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this BMP. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application can be affected by subgrade conditions, surface type, climate, and maintenance schedule. Frequent applications could

lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material Based (Short Lived) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material Based (Long Lived) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound should air cure within a maximum of 36 to 48 hours. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:2 to 1:1	10.0 – 20.0

Poly-Acrylamide and Copolymer of Acrylamide: Linear copolymer polyacrylamide is packaged as a dry flowable solid. When used as a stand alone stabilizer, it is diluted at a rate of 11lb/1,000 gal of water and applied at the rate of 5.0 lb/acre.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate costs:

Soil Binder	Cost per Acre
Plant-Material Based (Short Lived) Binders	$400
Plant-Material Based (Long Lived) Binders	$1,200
Polymeric Emulsion Blend Binders	$400 (1)
Cementitious-Based Binders	$800

(1) $1,200 for Acrylic polymers and copolymers

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

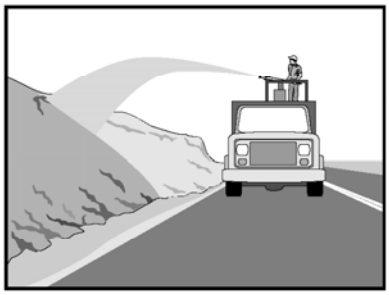
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Relative Cost	Low	Low	Low	Low
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

Straw Mulch EC-6



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-5 Soil Binders
EC-7 Geotextiles and Mats
EC-8 Wood Mulching

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a tackifier stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch is typically used for erosion control on disturbed areas until soils can be prepared for permanent vegetation. Straw mulch is also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment.

Limitations

- Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- There is a potential for introduction of weed seed and unwanted plant material.
- When straw blowers are used to apply straw mulch, the treatment areas must be within 150 ft of a road or surface capable of supporting trucks.
- Straw mulch applied by hand is more time intensive and potentially costly.

- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.

Implementation

- Straw shall be derived from wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw shall be used.
- A tackifier is the preferred method for anchoring straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking shall only be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier shall not be applied during or immediately before rainfall.
- In San Diego, use of straw near wood framed home construction has been frowned on by the Fire Marshall.

Application Procedures

- Apply straw at a minimum rate of 4,000 lb/acre, either by machine or by hand distribution.
- Roughen embankments and fill rills before placing the straw mulch by rolling with a crimping or punching type roller or by track walking.
- Evenly distribute straw mulch on the soil surface.
- Anchor straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating). Alternatively, use a tackifier to adhere straw fibers.
- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - On small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper".
  - On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. The netting shall be held in place using 11 gauge wire staples, geotextile pins or wooden stakes as described in EC-7, Geotextiles and Mats.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier shall be selected based on longevity and ability to hold the fibers in place. A tackifier is

typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is $2,500 per acre. Application by hand is more time intensive and potentially costly.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

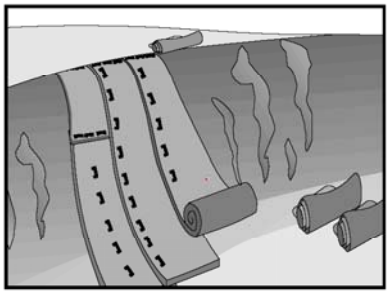
Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Geotextiles and Mats EC-7



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch
EC-4 Hydroseeding
EC-5 Soil Binders
EC-6 Straw Mulch
EC-8 Wood Mulching

Description and Purpose

Mattings of natural materials are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, matting may be used to stabilize soils until vegetation is established.

Suitable Applications

Mattings are commonly applied on short, steep slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks where moving water at velocities between 3 ft/s and 6 ft/s are likely to wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. Matting may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). Erosion control matting should be considered when the soils are fine grained and potentially erosive. These measures should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop
- Channels with flows exceeding 3.3 ft/s

- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs)

Limitations

- Properly installed mattings provide excellent erosion control but do so at relatively high cost. This high cost typically limits the use of mattings to areas of concentrated channel flow and steep slopes.
- Mattings are more costly than other BMP practices, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- Installation is critical and requires experienced contractors. The contractor should install the matting material in such a manner that continuous contact between the material and the soil occurs.
- Geotextiles and Mats may delay seed germination, due to reduction in soil temperature.
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).
- Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.
- Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
- Plastic results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until alternative measures, such as seeding and mulching, may be installed.
- Geotextiles, mats, plastic covers, and erosion control covers have maximum flow rate limitations; consult the manufacturer for proper selection.
- Not suitable for areas that have heavy foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.

Implementation

Material Selection

Organic matting materials have been found to be effective where re-vegetation will be provided by re-seeding. The choice of matting should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

The following natural and synthetic mattings are commonly used:

Geotextiles

- Material should be a woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil.
- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable rolled erosion control products (RECPs) are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable.
  - **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. It is designed to be used in conjunction with vegetation and has longevity of approximately one year. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples

should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket

installation, all check slots and other areas disturbed during installation must be re-seeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. When using jute matting on a seeded area, apply approximately half the seed before laying the mat and the remainder after laying the mat. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots are made of glass fiber strips, excelsior matting strips or tight folded jute matting blanket or strips for use on steep, highly erodible watercourses. The check slots are placed in narrow trenches 6 to 12 in. deep across the channel and left flush with the soil surface. They are to cover the full cross section of designed flow.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the friable seedbed made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft.

- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.

- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Relatively high compared to other BMPs. Biodegradable materials: $0.50 - $0.57/yd^2. Permanent materials: $3.00 - $4.50/yd^2. Staples: $0.04 - $0.05/staple. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre
Biodegradable	Jute Mesh	$6,500
	Curled Wood Fiber	$10,500
	Straw	$8,900
	Wood Fiber	$8,900
	Coconut Fiber	$13,000
	Coconut Fiber Mesh	$31,200
	Straw Coconut Fiber	$10,900
Non-Biodegradable	Plastic Netting	$2,000
	Plastic Mesh	$3,200
	Synthetic Fiber with Netting	$34,800
	Bonded Synthetic Fibers	$50,000
	Combination with Biodegradable	$32,000

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.
- Check that disturbed areas are seeded.

References

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

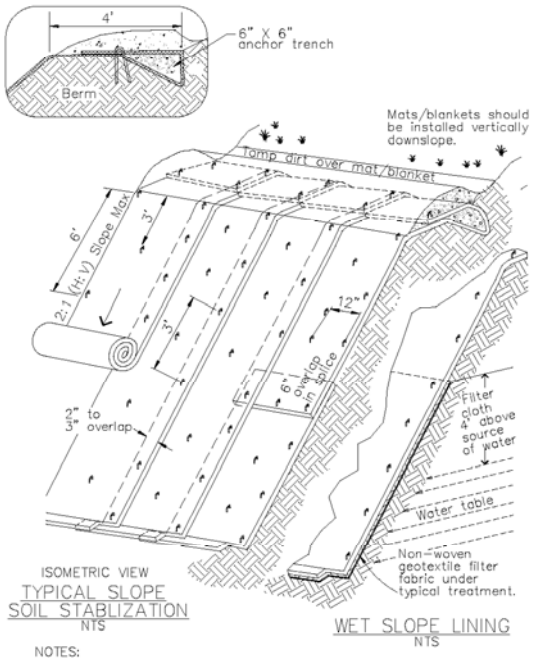
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

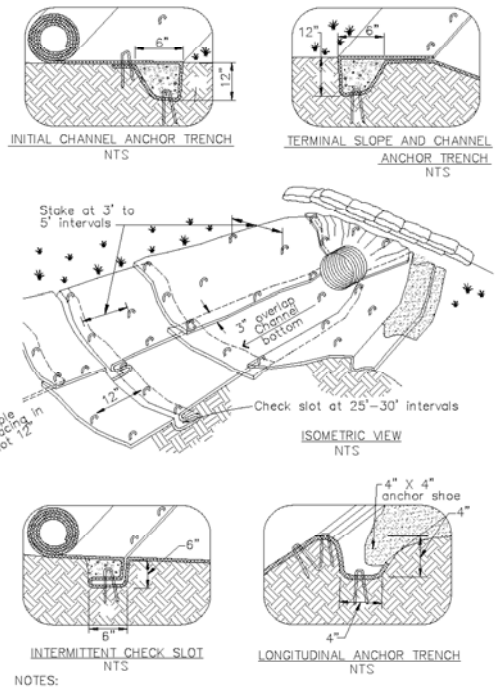


ISOMETRIC VIEW
TYPICAL SLOPE SOIL STABLIZATION
NTS

WET SLOPE LINING
NTS

NOTES:
1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

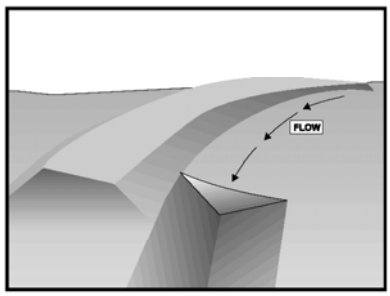
TYPICAL INSTALLATION DETAIL



NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

Earth Dikes and Drainage Swales EC-9



Objectives		
EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and

compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.

- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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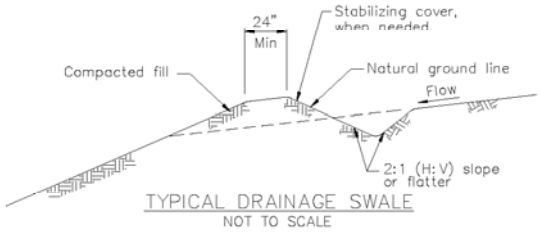
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

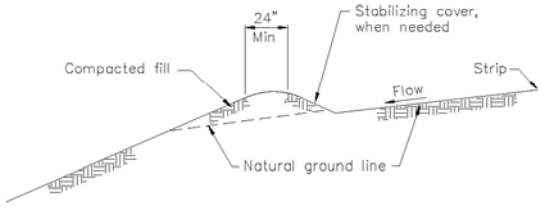
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Earth Dikes and Drainage Swales EC-9



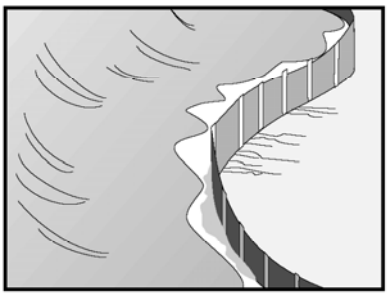
TYPICAL DRAINAGE SWALE
NOT TO SCALE

NOTES:
1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Silt Fence SE-1



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

Implementation

General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D46:32 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.
- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.
- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.
- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

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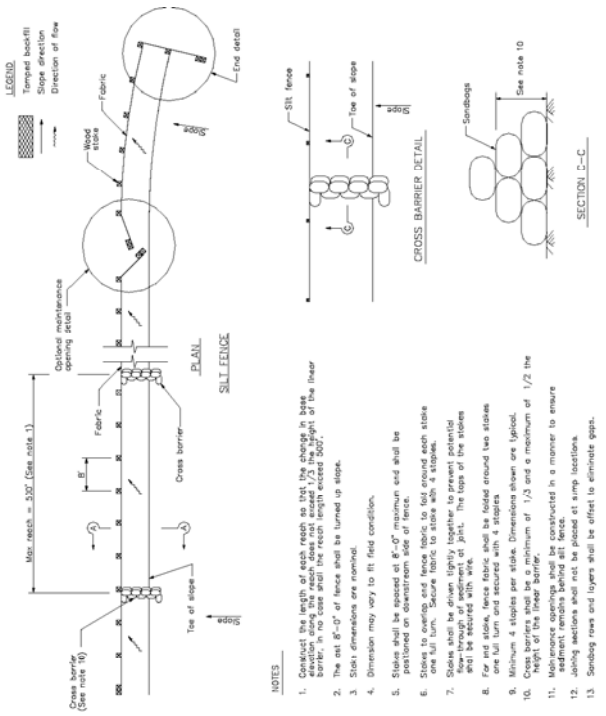
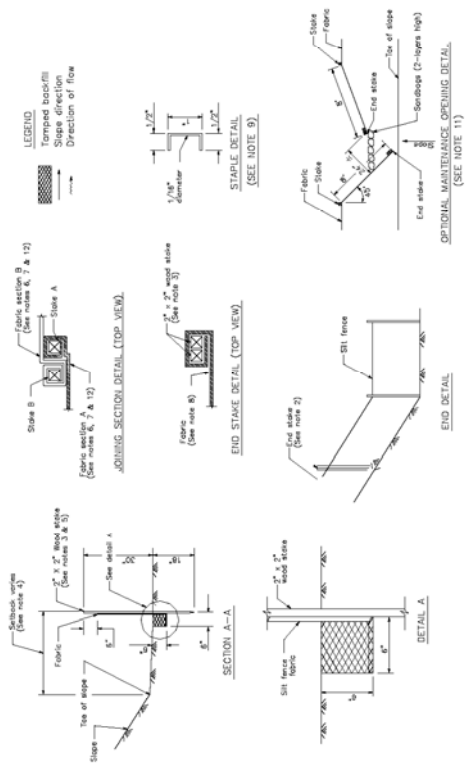
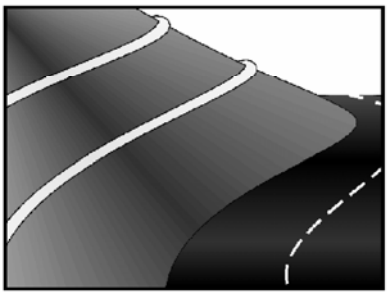




Fiber Rolls SE-5



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

Description and Purpose

A fiber roll consists of straw, flax, or other similar materials bound into a tight tubular roll. When fiber rolls are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- As check dams in unlined ditches
- Down-slope of exposed soil areas
- Around temporary stockpiles

Limitations

- Fiber rolls are not effective unless trenched

- Fiber rolls at the toe of slopes greater than 5:1 (H:V) should be a minimum of 20 in. diameter or installations achieving the same protection (i.e. stacked smaller diameter fiber rolls, etc.).
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.

Implementation

Fiber Roll Materials

- Fiber rolls should be either prefabricated rolls or rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 8 in. diameter.
- Bind roll at each end and every 4 ft along length of roll with jute-type twine.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into a 2 to 4 in. deep trench with a width equal to the diameter of the fiber roll.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

Removal

- Fiber rolls are typically left in place.

- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Costs

Material costs for fiber rolls range from $20 - $30 per 25 ft roll.

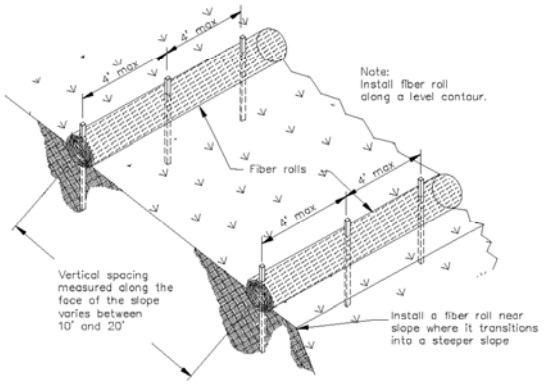
Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage depth, usually one-half the distance between the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site of disposed at an appropriate location.
- If fiber rolls are used for erosion control, such as in a mini check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

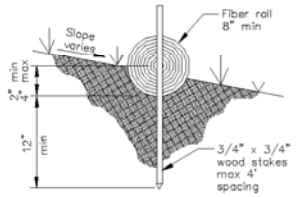
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

SE-5 Fiber Rolls



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Street Sweeping and Vacuuming SE-7

Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TR	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Description and Purpose
Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications
Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations
Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation
- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives
None

SE-7 Street Sweeping and Vacuuming

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

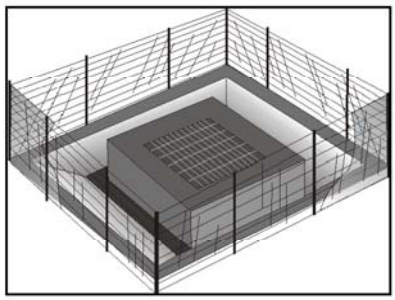
Costs
Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd³ hopper) to $88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Storm Drain Inlet Protection SE-10



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Description and Purpose
Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications
Every storm drain inlet receiving sediment-laden runoff should be protected.

Limitations
- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Filter Fabric Fence*** - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
  5. Backfill the trench with gravel or compacted earth all the way around.
- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area.

- ***DI Protection Type 3 - Gravel bag*** - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.
  1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
  2. Construct on gently sloping street.
  3. Leave room upstream of barrier for water to pond and sediment to settle.
  4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
  5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
- ***DI Protection Type 4 – Block and Gravel Filter*** - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.
  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Costs

- Average annual cost for installation and maintenance (one year useful life) is $200 per inlet.

Inspection and Maintenance

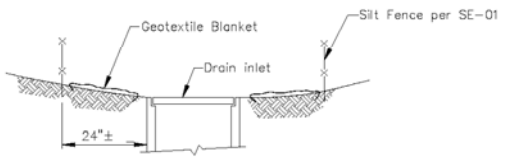
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site ore disposed at an appropriate location.
- Remove storm drain inlet protection once the drainage area is stabilized.
  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

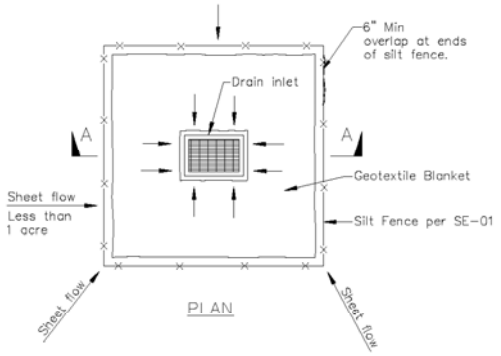
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.



SECTION A–A

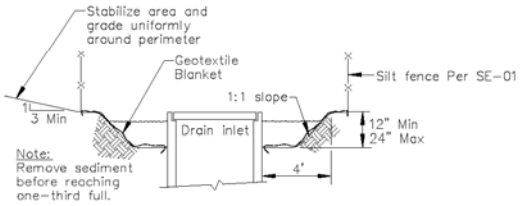


PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



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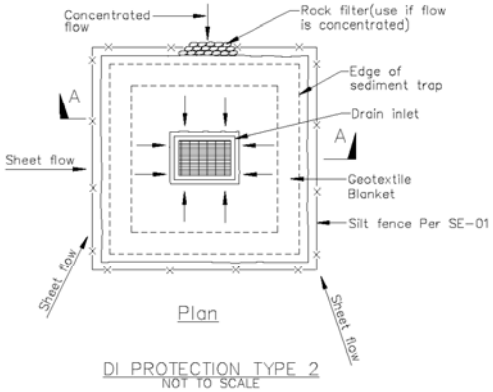
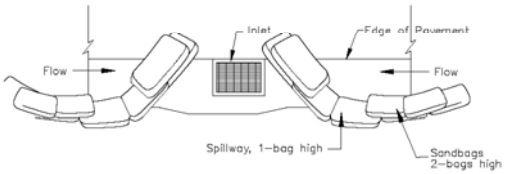


Plan

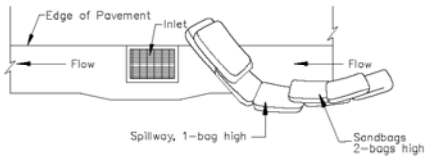
DI PROTECTION TYPE 2
NOT TO SCALE

Notes

1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

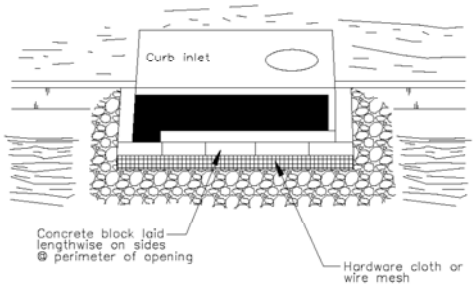


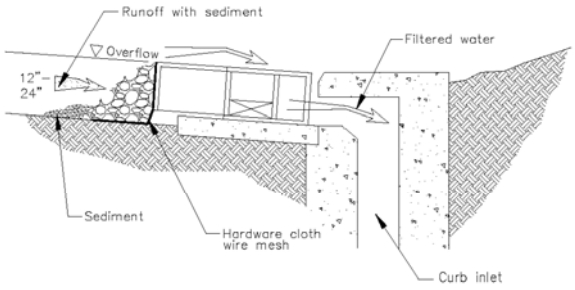
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

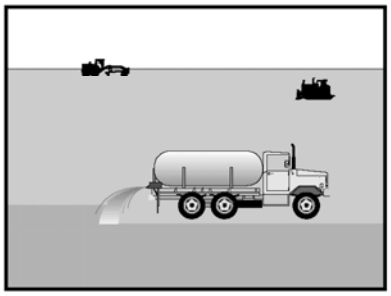
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Wind Erosion Control WE-1



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

SITE CONDITION	DUST CONTROL PRACTICES								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X		X		X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/ Excavation			X	X		X			X
Truck Traffic on Unpaved Roads			X	X	X		X	X	
Mud/Dirt Carry Out					X		X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize inactive construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

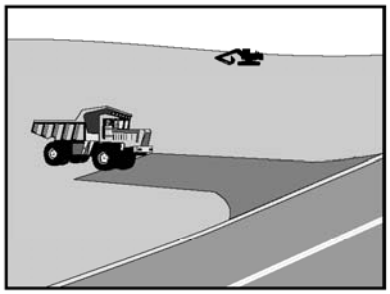
Wind Erosion Control WE-1

Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stabilized Construction Entrance/Exit TC-1



Objectives		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

Stabilized Construction Entrance/Exit TC-1

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

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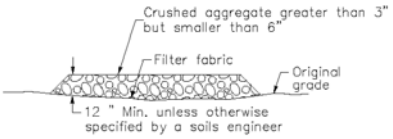
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



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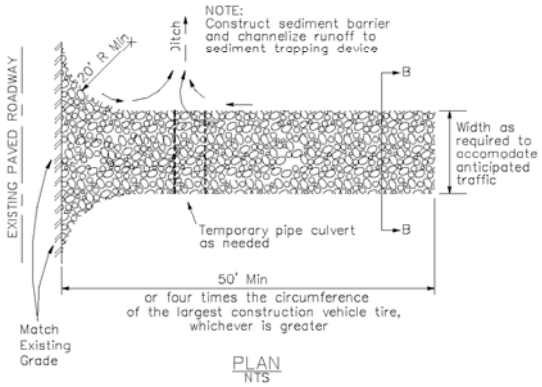
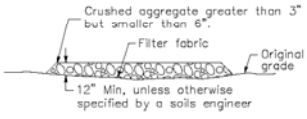


PLAN
NTS



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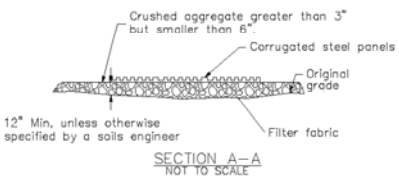

SECTION A–A
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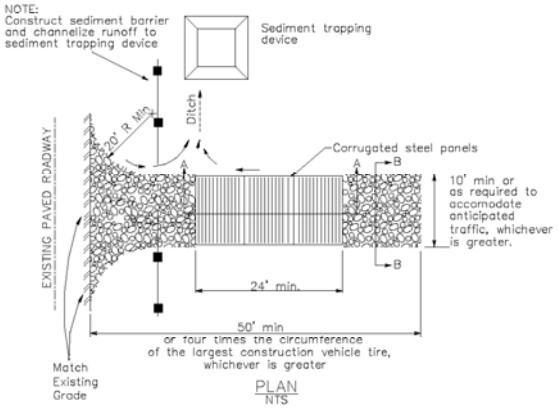

PLAN
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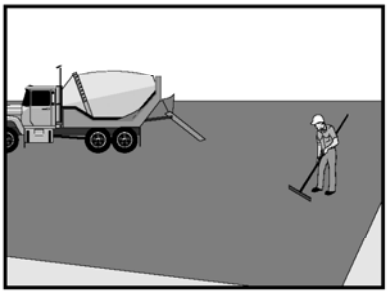
Paving and Grinding Operations NS-3



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is in the forecast.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).

- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- If paving involves an onsite mixing plant, follow the stormwater permitting requirements for industrial activities.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses, These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC and AC waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drains or watercourses. Install silt fence until structure is stabilized or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; or SE-5, Fiber Rolls.
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt must be recycled or disposed.
  - Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 1 ft of material.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Dig out activities should not be conducted in the rain.
- Collect dig out material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.
- If dig out material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
  - Old asphalt must be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile or dispose of properly.
- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if allowed by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate must not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized.
- Drainage inlet structures and manholes should be covered with filter fabric during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials rather than burying. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks, and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing when vehicle is deadheaded.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

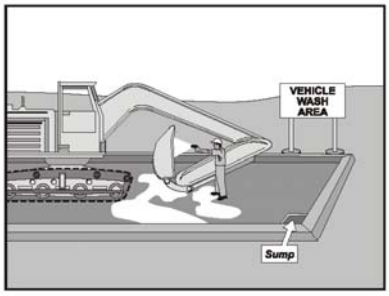
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

NS-8 Vehicle and Equipment Cleaning

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

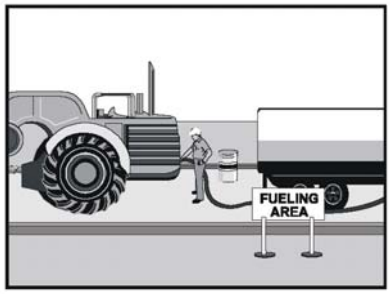
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Objectives		
EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents	
Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

Vehicle and Equipment Fueling NS-9

References

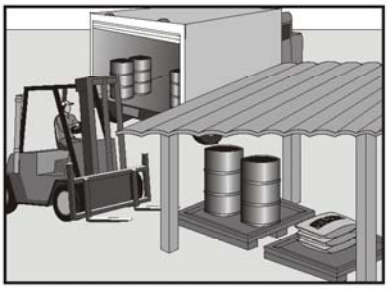
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Delivery and Storage WM-1



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components

WM-1 Material Delivery and Storage

- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be supplied for all materials stored.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located near the construction entrances, away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area which will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.
- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.

Material Delivery and Storage WM-1

- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Chemicals should be kept in their original labeled containers.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, each temporary containment facility should be covered during non-working days, prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep an ample supply of spill cleanup materials near the storage area.
- Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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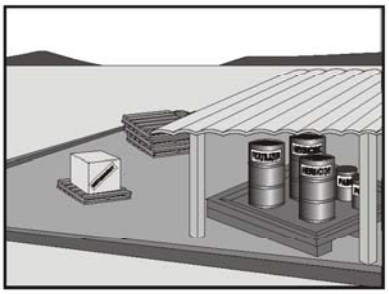


Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydro seeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Require contractors to complete the "Report of Chemical Spray Forms" when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two–week intervals in the non-rainy season to verify continued BMP implementation.
- Maintenance of this best management practice is minimal.
- Spot check employees and subcontractors throughout the job to ensure appropriate practices are being employed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix"

- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammoniacal, copper, zinc, and arsenate

- During the rainy season, treated wood should be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected further as follows:

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Costs

All of the above are low cost measures.

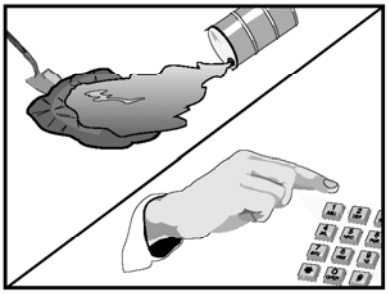
Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Spill Prevention and Control WM-4



Objectives		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

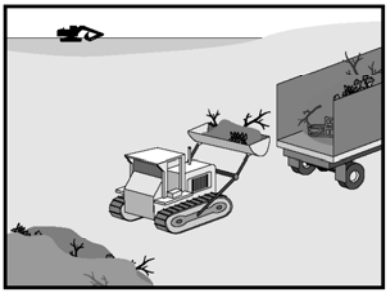
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Objectives		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials

- Highway planting wastes, including vegetative material, plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

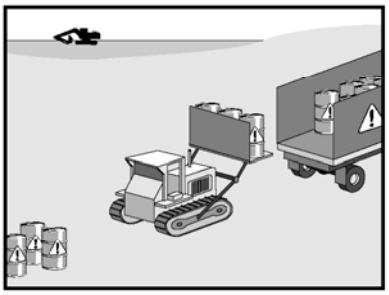
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

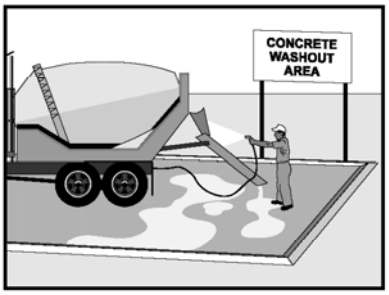
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employee and subcontractors.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result form demolition activities
- Slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition
- Concrete trucks and other concrete-coated equipment are washed onsite
- Mortar-mixing stations exist
- See also NS-8, Vehicle and Equipment Cleaning

Limitations

- Offsite washout of concrete wastes may not always be possible.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Perform washout of concrete trucks offsite or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Slurry residue should be vacuumed and disposed in a temporary pit (as described in OnSite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and

minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Straw bales, wood stakes, and sandbag materials should conform to the provisions in SE-9, Straw Bale Barrier.
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

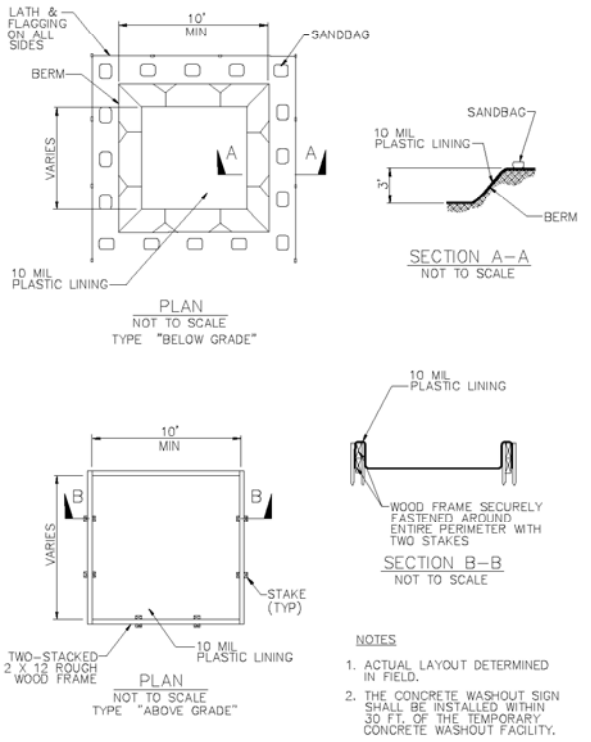
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

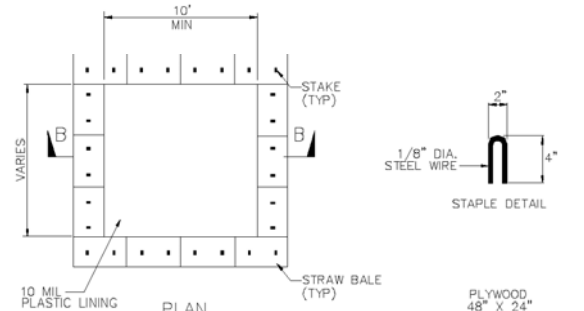
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

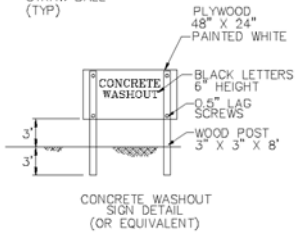
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

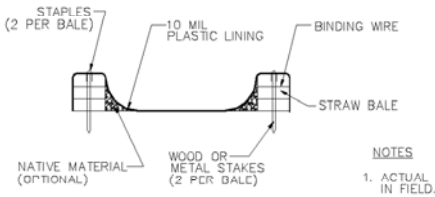


NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.







NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Attachment F: Personnel Training Log

Attachment G: Subcontractor List and Notification Log

Attachment H: Construction Site Inspection Log and Inspection Reports

Attachment I: Corrective Action Log

Attachment J: Water Quality Sampling Activity Log

Water Quality Sampling Reports are bound separately.

Attachment K: Notice of Termination (NOT)

APPENDIX B

HABITAT RESTORATION/ENHANCEMENT PLAN

HABITAT RESTORATION / ENHANCEMENT PLAN FOR THE TEMPORARY CONSTRUCTION STAGING ADDENDUM, JAMUL GAMING FACILITY PROJECT

October 21, 2014

Prepared for:

ENVIRONMENTAL DATA SYSTEMS, INC.

and

JAMUL INDIAN VILLAGE

Prepared by:

G.O. Graening, PhD, MSE

NATURAL INVESTIGATIONS COMPANY
6124 Shadow Lane, Citrus Heights, CA 95621

INTRODUCTION

1.1. PROJECT LOCATION AND DESCRIPTION

On behalf of Environmental Data Services Inc. and the Jamul Indian Village, Natural Investigations Company has prepared this habitat restoration / enhancement plan for the proposed temporary parking and laydown area on 2.1 acres of the 87-acre parcel (the Project Area), approximately one mile south of the community of Jamul, in unincorporated San Diego County (Figure 1).

The Tribe is proposing temporary use of approximately 2.1 acres of the adjacent 87-acre parcel during construction of the gaming facility (Figure 2). This particular temporary use area was chosen to minimize potential environmental impacts, including the facts that no sensitive habitats exist within the area, no special-status species occupy the area, no cultural or historical resources occupy the area, and the area has minimal aesthetic impact because it is hidden from most vantage points. Signage and worker exclusion fencing would be placed around the entire perimeter to contain workers within the temporary use area.

This temporary use area would accommodate the daily parking of approximately 250 to 300 automobiles belonging to construction workers, as well as some material storage (also called laydown) (Figure 3). The vehicles would enter and exit this temporary use area only from the gaming facility construction site (the Jamul Indian Village). No grading of the project area is allowed. To ensure that no special-status plant or animal species are impacted, pre-construction surveys for special-status species would be performed by a qualified biologist (i.e. meeting the standards of CDFW and USFWS). If special-status species are detected, CDFW and USFWS would be consulted and avoidance measures implemented. The existing surface would be protected by the placement of a temporary covering of construction (geotextile) fabric, similar to weed cloth or filter fabric, and then 2 to 3 inches of gravel. During this temporary use period, an effective erosion control and pollution prevention plan would be implemented that would ensure that any dripping or leaking fluids from vehicles would be cleaned and removed and that stormwater entering and leaving the site would be properly controlled and treated. After the temporary use period (approximately 15 months), all vehicles and construction materials would be removed; then the gravel and construction fabric would be carefully removed. Then, a habitat restoration / enhancement plan would then be implemented to return the temporary use area to a condition better than the existing condition. The habitat restoration / enhancement plan includes removal of invasive species, aeration of the soil where compacted, and the planting and irrigation of native plants to re-establish native grassland habitats.

2. EXISTING CONDITIONS

The Project Area is located within the Peninsular Ranges geographic subregion, which is contained within the Southwestern geographic subdivision of the larger California Floristic Province (Hickman 1993). The region is in climate Zone 21 – “Ocean-influenced southern California”, characterized by infrequent frost, with mild to hot, dry summers and mild, wet winters moderated by marine air influx (Hickman 1993; Brenzel 2001). The topography of the Project Area is undulating and slopes generally eastward toward the Willow Creek drainage, an intermittent drainage tributary to Jamul Creek.

The Project Area currently contains only one terrestrial natural community/habitat types: non-native annual grassland (Figure 4), although many parts of the Project Area are barren. Grazing disturbances, rather than periodic wildfires, keep this plant community from undergoing successional changes to woodland or scrub. Plant species common in this community include European annual grasses (*Avena, Bromus, Hordeum, Festuca*), and forbs, such as turkey mullein (*Eremocarpus setigerus*), yellow star thistle (*Centaurea solstitialis*), and black mustard (*Brassica*

nigra). These annual grasslands have replaced the original habitats of native grassland (e.g. perennial bunchgrasses) and Diegan coastal sage scrub.

3. POTENTIAL PROJECT IMPACTS

The Project Area will be used as a parking area and material laydown area. No trenching, grubbing, or grading of the Project Area is proposed during construction activities. Other temporary construction-related modifications include the placement of t-posts for exclusion fencing. Parking area construction and use activities may result in soil compaction and the trampling of vegetation. Irrigation for fire and dust suppression may stimulate the growth of invasive plant species. Construction vehicles or equipment may inadvertently transport weeds into the Project Area. Construction vehicles or equipment may drip automotive fluids onto the ground.

4. HABITAT RESTORATION / ENHANCEMENT

4.1. PLAN PURPOSE AND GOALS

To mitigate for project impacts associated with habitat degradation, such as compaction from vehicles or the spread of invasive species, a habitat restoration / enhancement plan (Plan) will be implemented. The goal is to return the temporary use area to a condition better than the existing pre-project condition. Areas currently containing non-native grassland that were degraded or destroyed will be converted to native grassland.

The following restoration activities will be performed:

- Any native (coastal scrub) shrub that is destroyed will be replaced with the identical species
- Any invasive plant species that were established during construction activities will be removed by hand.
- Suppression or removal of invasive species that existed prior to project commencement, where appropriate
- Where soil is severely compacted from construction activities, soil aeration will be performed, such as with a plug aerator or spike aerator.
- Importation of topsoil or the addition of soil amendments, where appropriate
- Planting and irrigation of native plants to re-establish or enhance existing habitats to their original or higher-quality condition

4.1.1. Target Vegetation Community Types

Target vegetation types were selected based on the existing topography, soils, and surrounding vegetation, and historical aerial photo interpretation. Whenever possible, enhancement of currently disturbed vegetation to in kind, high quality habitat will be preferred over full revegetation. No native plants will be intentionally removed or harmed during revegetation or enhancement procedures. Target vegetation types are described next.

NATIVE GRASSLAND

The following Holland Vegetation Types (Oberbauer et al. 2008) were selected as the target vegetation communities for revegetation of native grasslands within the Project Area:

42110 Valley Needlegrass Grassland

Description: A midheight (to 2 ft) grassland dominated by perennial, tussock-forming *Stipa* (*Nasella*) *pulchra*. Native and introduced annuals occur between the perennials, often actually exceeding the bunchgrasses in cover. In San Diego County, native perennial herbs such as *Sanicula*, *Sidalcea*, *Sisirynchium, Eschscholzia* or *Lasthenia* are present. The percentage cover of native species at any

one time may be quite low, but is considered native grassland if 20% aerial cover of native species is present.

Site Factors: Usually on fine-textured (often clay) soils, moist or even waterlogged during winter, but very dry in summer. Often interdigitates with Oak Woodlands (71100) on moister, better-drained sites. In San Diego County this becomes Montane Perennial grassland above approximately 2000 feet in elevation.

Characteristic Species: *Achillea borealis*, *Achyrachaena mollis*, *Agoseris heterophylla*, [*Avena fatua*], *Bloomeria crocea, Brodiaea lutea,* [*Bromus diandrus, B. mollis, B. madriatensis* ssp. *rubens*], *Chlorogalum pommeridianum, Clarkia purpurea, Dodecatheon jefferyi*, *Eschscholzia* spp., *Lasthenia* spp., *Melica californica, M. imperfecta, Orthocarpus attenuatus*, *Plantago hookeriana californica*, *Poa scabrella*, *Sanicula* spp., *Sidalcea* spp., *Sisirynchium* spp., *Stipa cernua*, *Stipa* (*Nasella*) *pulchra*.

Distribution: Formerly extensive around the Sacramento, San Joaquin, and Salinas Valleys, as well as the Los Angeles Basin, but now much reduced. The relationship of this type to the Potrero Grasslands of the Peninsular Ranges needs clarification. In San Diego County: Alpine (Wright's Field), Ramona, Olivenhain, San Marcos, Camp Pendleton, Rincon, Mesa Grande (?), Eagle Peak Road (?), and Otay Mesa.

42300 Wildflower Field

Description: An amorphous grab bag of mostly native, herb-dominated types noted for conspicuous annual wildflower displays. Dominance varies from site to site and from year to year at a particular site. In San Diego County, often a subtype of Creosote Bush Scrub (33100), Wet Montane Meadow (45110), Foothill/Montane Perennial Grassland (42400), and formerly on coastal mesas.

Site Factors: Usually on fairly poor sites (droughty, low in nutrients), associated with Grasslands or Oak Woodlands on surrounding, more productive sites. In San Diego County, mostly on sandy soils.

Characteristic Species: *Eschscholtzia californica, Gilia bicolor, Layia platyglossa, Lupinus bicolor, Orthocarpus attenuatus, O. purpuresens*, *Oenothera* spp.

Distribution: Valleys and foothills of the Californian Floristic Province except the north coast (too wet) region. Below about 2000 ft. in the north, 4000-5000 ft. in the south. In San Diego County: Lower Coyote Creek near Borrego Springs, Mataguay, Upper Cuyamaca Valley.

42400 Foothill/Mountain Perennial Grassland

Description: Generally isolated grasslands within Oak or Pine Woodland or Chaparral and associated with meadows with a range of Marshland, Big Basin Sagebrush or Steppe.

Characteristic Species: *Nasella pulchra, Leymus triticoides, Hordeum brachyantherum, Agrostis* spp., *Muhlenbergia rigens, Poa pratensis, Cirsium tioganum, Pteridium aquilinum, Iris missouriensis*

Distribution: Corte Madera, upper Rancho Guejito, Spoke Ranch, and all major valleys in the Palomar Cuyamaca, and Laguna Mountains.

4.2. REMOVAL OF WEEDS / INVASIVE SPECIES

Small clumps of non-native, invasive plants that established because of construction activities will be removed by either hand-pulling or hand digging with hoes or other hand implements. Any large non-native woody species will be cut and the stump left in the ground (to reduce erosion). A six foot radius will be cleared of invasive plants or other competing vegetation around each new container planting.

Where deemed appropriate by the project biologist, and where allowed under County regulations, herbicides will be applied to the non-native grassland within the Project area. Herbicides and pesticide applications must be performed by a State-licensed applicator.

4.3. REPLANTING

Any soil, soil amendments, mulch, or erosion control products that are imported into the Project Area will be certified weed-free.

The entire Project area will be seeded with a native grassland seed mix, and then covered with mulch. The seeds and mulch may be hand broadcasted or applied with hydroseeding / hydromulching equipment.

Any native (coastal scrub) shrub that is destroyed will be replaced with the identical species.

At least 100 container plants will be planted within the Project Area. A plant palette is provided in the Appendix; this is a list of plants available at local native plant nurseries that are appropriate for the target vegetation community types. All container plants, cuttings, and seed stock obtained will be derived from local genetic sources and be locally native species (i.e., no cultivars). All containers must be at least 1 gallon in size. Final siting, planting densities, and planting styles will follow randomly spaced, naturally clumped patterns and may be modified by the project biologist.

All planting holes will be pre-irrigated prior to planting and irrigated again following planting ("watering-in"). A berm of soil must be created around each planting with approximately a 3-foot radius to capture rain from surface runoff or to hold water from supplemental watering activities. Any staking should be removed after 1 year to prevent girdling or weakened stems from forming.

Container plants will be mulched at a depth of 4 inches and diameter of 4 feet or 2 times the diameter of the dripline of the plant, whichever is greater. Mulch will consist of coarse organic matter low in salts, pathogens, weed seeds, and inorganic materials. Mulch will not be placed directly against the main stem of the plant to prevent decay.

It is recommended that the temporary perimeter fencing installed for construction activities remain in place during the plant establishment period, to deter unauthorized access and trampling. Signage is also recommended to inform visitors of the restoration processes and prohibit access to restored areas.

Should mammal herbivory pose a significant threat to the success of the Plan, exclusionary fencing or browse cages may be installed around plantings, such as caging with metal t-posts and hardware fencing in at least a 3-foot radius away from the plant stem.

4.4. MAINTENANCE AND MONITORING PLAN

4.4.1. Irrigation

For at least 2 years, replacement plantings must be protected from drought stress by installation of an irrigation system or at the least, supplemental waterings within the bermed area of each replacement planting and broadcast watering for grass seeds mixture. For plantings, periodic deep waterings, rather than frequent shallow waterings, are preferred. Watering must be sufficient to wet the soil within the bermed area to a depth of 30 inches, and without causing soil erosion. Replacement plantings must be protected from fire damage by maintaining a defensible area by clearing away, trimming, or otherwise suppressing tall grasses and weeds. Regular mulching is recommended to facilitate fire protection and reduce watering requirements.

4.4.2. Weed and Pest Control

Weed eradication will be conducted as necessary to minimize competition that could prevent establishment of native species; but will be conducted no less than two times during the first year. Hand-pulling or mechanical removal will be the primarily methods employed. Herbicides may be used. Herbicides and pesticide applications must be performed by a State-licensed applicator. As needed, herbivore exclusion measures should be employed.

4.4.3. Supplemental Planting and Seeding

The replacement container plant survivability goal is 80% coverage at the end of year 1 and year 2. After the year 1 and the year 2 inventory, should the recruitment of native species fail following non-native plant removal or should more than 20% coverage of the grasses, forbs, or container plants fail or fall into poor health, supplemental planting will occur using the same species or another species from the plant palette. All supplemental planting will occur within fall and winter months when planting and germination conditions are more favorable.

5. REFERENCES

Brenzel, K.N. 2001. Sunset Western Garden Book. Sunset Publishing Corporation, Menlo Park, California. 768 pp.

Hickman, J.C., editor. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley, California. 1,400 pp.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, The Resources Agency, Nongame Heritage Program, Department of Fish and Game, Sacramento, California. 156 pp.

Oberbauer, T., M. Kelly, and J. Buegge. 2008. Draft Vegetation Communities of San Diego County. Based on “Preliminary Descriptions of the Terrestrial Natural Communities of California”, Robert F. Holland, Ph.D., October 1986.

FIGURES

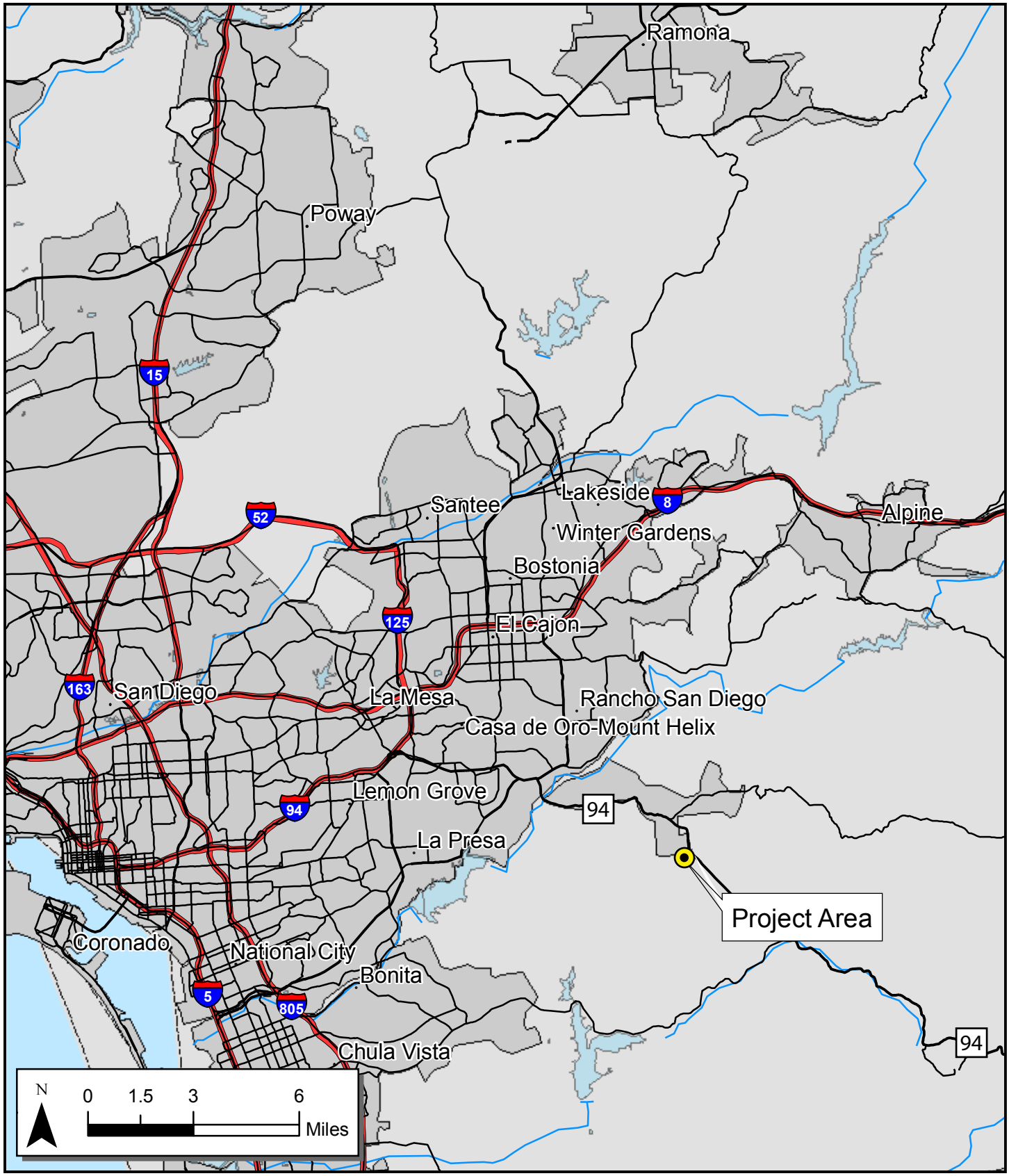


Figure 1. Location of the Project Area

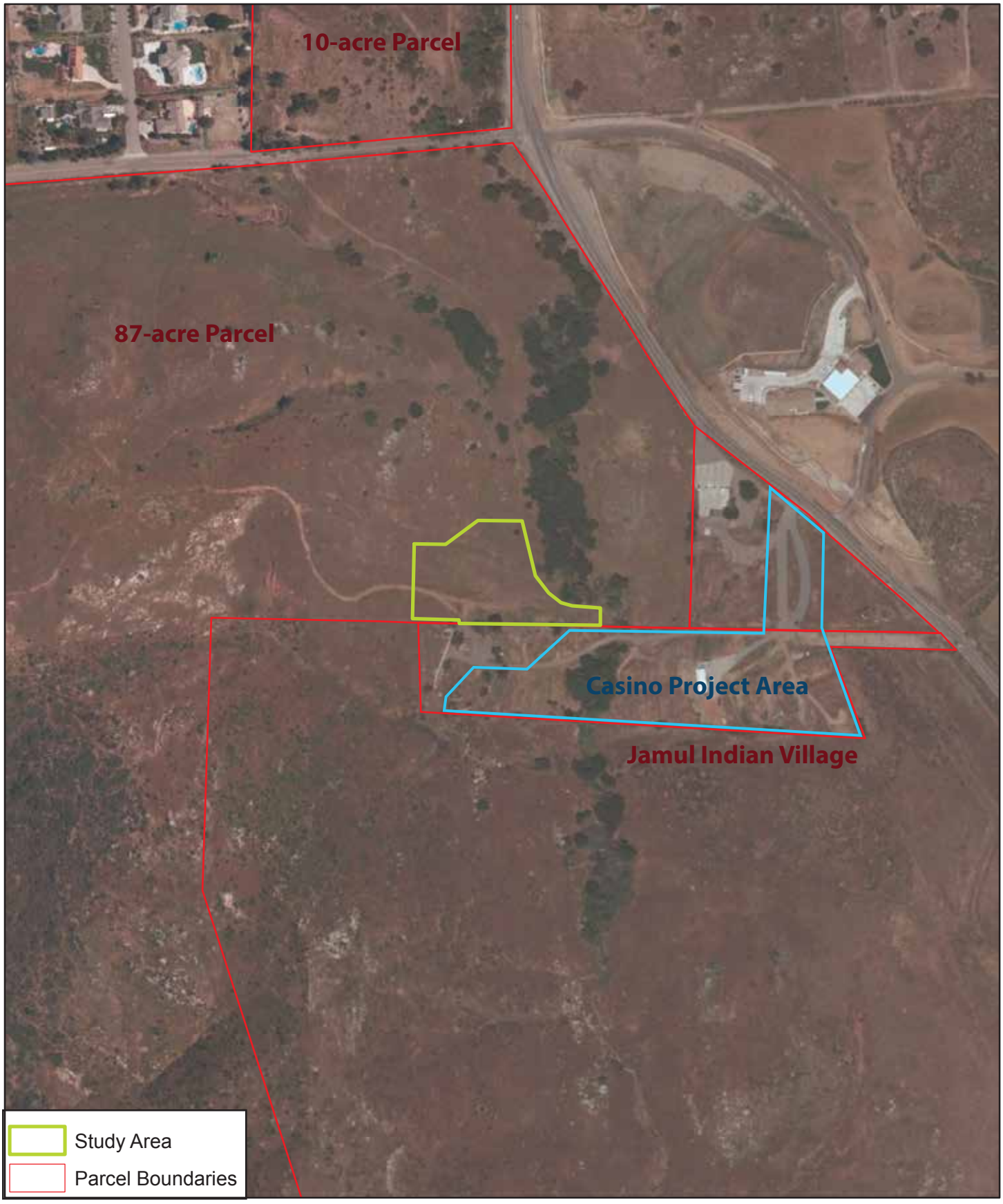


Figure 2
Location of Addendum Project Area in Relation to Adjacent Properties

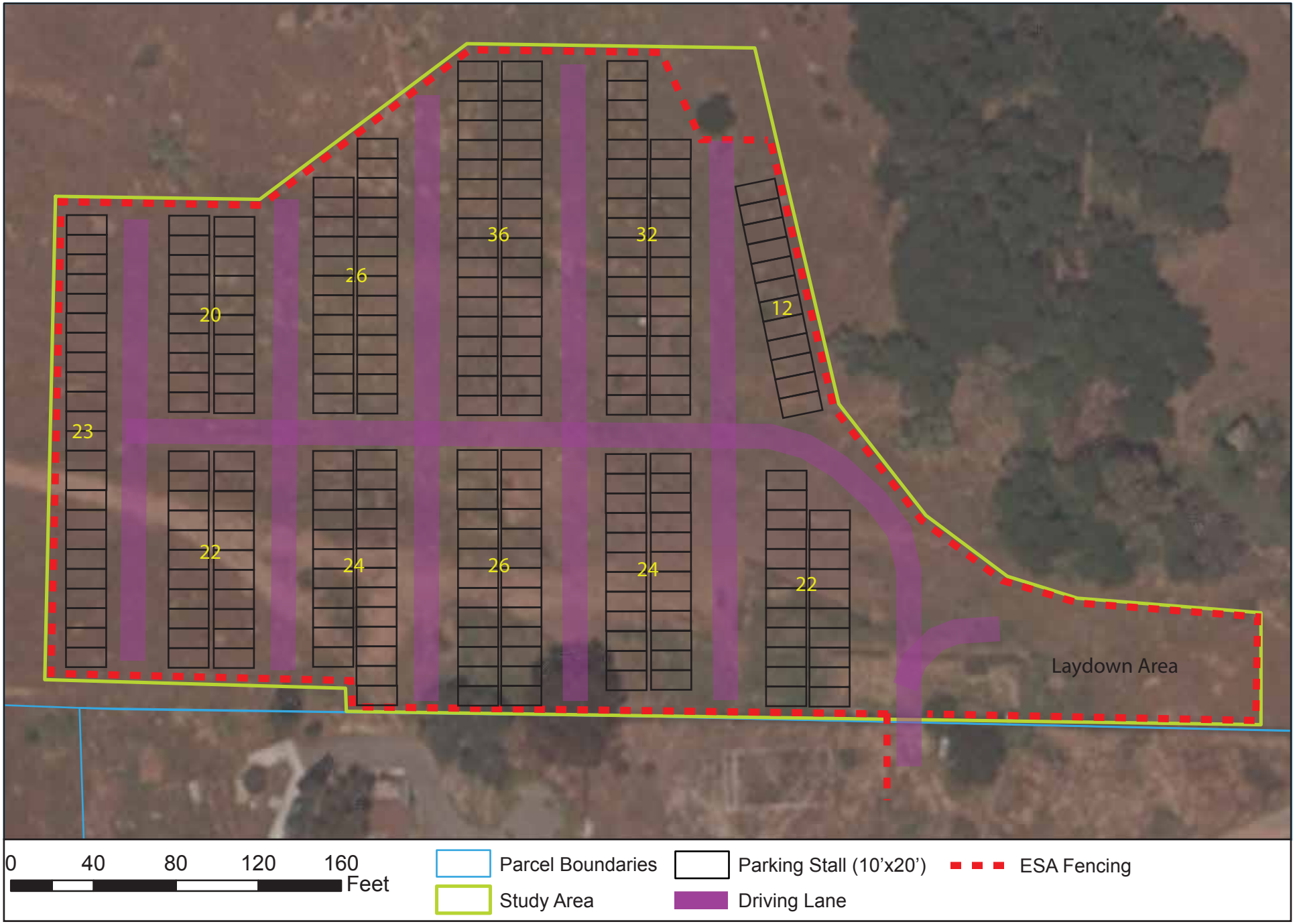


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Figure 3

Proposed Temporary Parking and Laydown Areas on the 87-acre Parcel

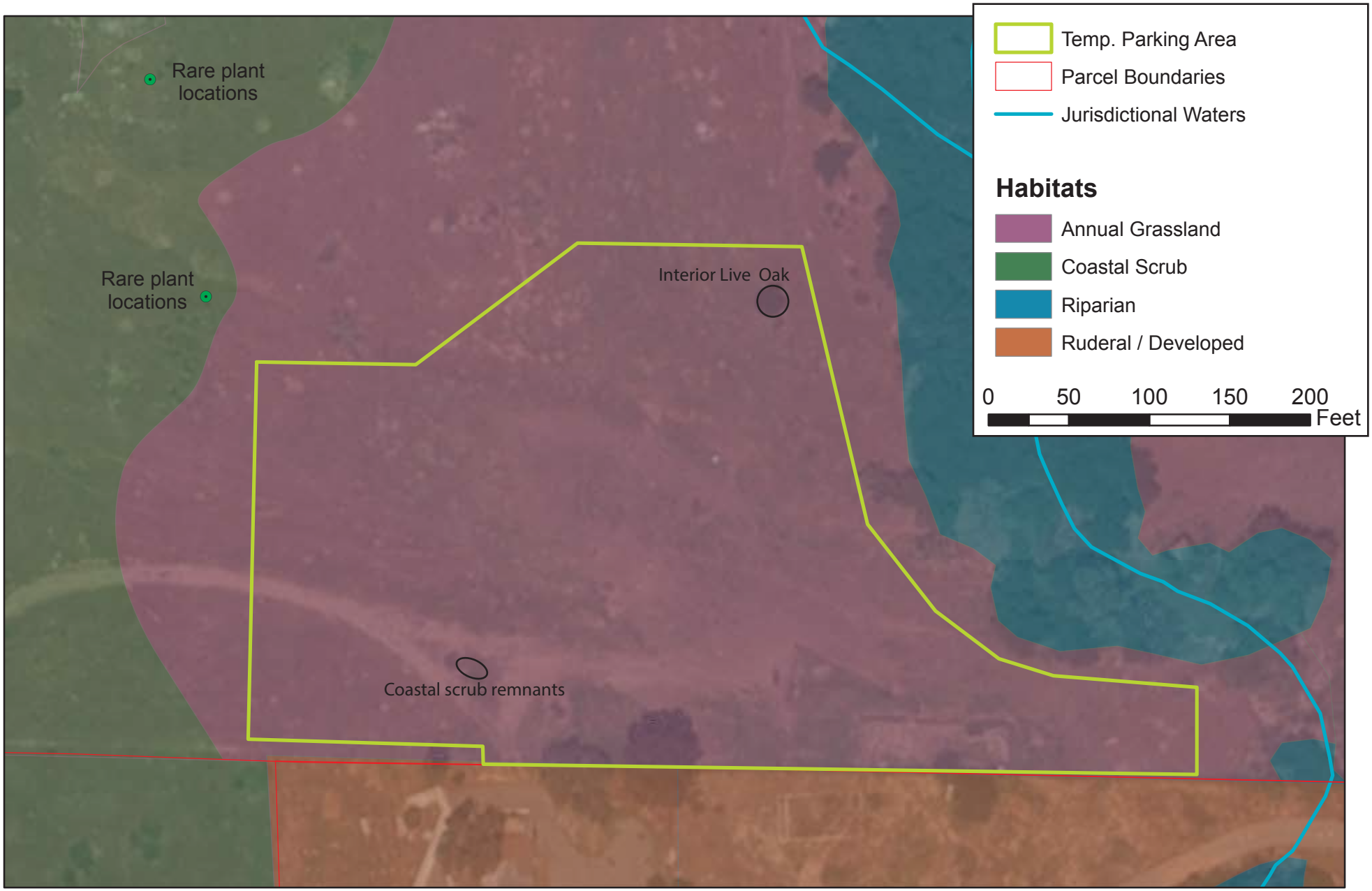


Figure 4. Vegetation Communities in the Vicinity of the Temporary Parking Area

APPENDIX

NATIVE GRASSLAND REVEGETATION PLANT PALETTE

Taxonomic Name (Common Name)

Achillea borealis (Common yarrow)
Achyrachaena mollis (Blow wives)
Agrostis exarata (spike bent grass)
Agoseris heterophylla (Mountain dandelion
Aristida temipes var. *hamulosa* (Hook three-awn grass)
Bloomeria crocea var. *crocea* (Common golden star)
Brodiaea lutea (Golden brodiaea)
Bromus carinatus (California brome)
Calochortus splendens (Lilac mariposa)
Castilleja exserta (Common owl's clover)
Castilleja (*Orthocarpus*) *attenuatus* (Narrow-leaved owl's clover)
Chlorogalum pommeridianum (Soaproot)
Clarkia purpurea (Winecup fairyfan)
Dichelostemma capitatum (Blue dicks)
Deinandra fasciculate (Fascicled tarweed)
Deinandra paniculata (Paniculate tarweed)
Elymus condensatus (giant wild rye)
Elymus glaucus (blue wild rye)
Eriogonum fasciculatum (CA buckwheat)
Eriophyllum confertiflorum (golden yarrow)
Eschscholzia californica (California poppy)
Festuca microstachys (small fescue)
Hordeum brachyantherum (Meadow barley)
Koeleria macrantha (June grass)
Lasthenia californica (Coast goldfields)
Lupinus bicolor (Lindley's annual lupine)
Melica imperfect (California melic)
Muhlenbergia rigens (deer grass)
Nemophila menziesii (Baby blue eyes)
Oenothera spp. (Primrose)
Plantago erecta (California plantain)
Poa scabrella (Pacific bluerass)
Sanicula spp. (Sanicle)
Sidalcea spp. (Checkerblooms)
Sisyrinchium bellum (blue-eyed grass)
Stipa cernua (nodding needlegrass)
Stipa coronata (giant stipa)
Stipa lepida (Foothill needlegrass)
Stipa pulchra (purple needlegrass)

APPENDIX C

SEPTEMBER 2014 BIOLOGICAL SURVEY

TO:
Mr. Joe Broadhead
Environmental Data Systems, Inc.
1007 7th Street, Suite 308
Sacramento CA 95814

and

Jamul Indian Village

SUBJECT:
Technical Memo: Biological Surveys on the 10-acre and 87-acre Parcels for the Temporary Construction Staging Addendum, Jamul Gaming Facility Project, Jamul, CA.

INTRODUCTION

The Jamul Indian Village and their construction contractor are proposing to construct a temporary parking area on 1 of 5 areas within the 10-acre Parcel or the 87-acre Parcel, adjacent to the Jamul Indian Village (Exhibit 1). This technical memo documents the findings of two biological surveys of these five areas (approx. 8.5 acres). The purpose of the biological surveys was to map natural plant communities and any special-status habitats, and search for the presence of federally-listed species and other special-status species for the Temporary Construction Staging Addendum.

METHODS

Dr. G.O. Graening performed two the biological surveys on August 4th and 28th, 2014. On the first survey, Dr. Graening was accompanied by archaeologist Roy Pettus, M.A. (Natural Investigations Co.) and Jamul Indian Village staff members Richard Cousins (Cultural Resource Dept.) and Jesse Pinto (Environmental Dept.). On the second survey, Dr. Graening was accompanied Jesse Pinto.

On both survey dates, field conditions were sunny and warm, with temperatures in the 90's F. The survey area consisted of the five proposed parking areas and an additional 25 foot buffer around these parcels. Survey efforts emphasized the search for any special-status species or habitats that had documented occurrences, in databases queried, within the survey area or vicinity. Focal species consisted of least Bell's vireo, coastal California gnatcatcher, southwestern willow flycatcher, arroyo toad, Quino checkerspot butterfly, Hermes copper butterfly, and any rare plants or occupied nests. Field glasses were used to assist in the ocular surveys. Wildlife sign—tracks, feathers and shedding, burrows, scat, etc.—were interpreted to detect species not actually seen. All visible fauna and flora observed were recorded in a field notebook and identified to the appropriate taxon. Where detected, the location of any special-status species was georeferenced with a geographic positioning system receiver with accuracy of 1 meter or finer.

RESULTS

Vegetation Types and Plants Present
The project areas contain three terrestrial natural community/habitat types: ruderal/urbanized; non-native annual grassland; and Diegan coastal sage scrub. The majority of the survey area is ruderal/urbanized or over-grazed non-native annual grassland. Most vegetation was in a dormant

stage during this drought summer season. Although the CNDDB lists rare plants in the vicinity of the project area, no special-status plant species were detected during these field surveys.

Within the Southern 87-acre Parcel Parking Area (about 2.1 acres), only one terrestrial natural community/habitat type is present: non-native annual grassland, although many parts of the Project Area are barren. Grazing disturbance, rather than periodic wildfires, has kept this plant community from undergoing successional changes back to coastal woodland or scrub. Plant species common in this community include European annual grasses (*Avena*, *Bromus*, *Hordeum*, *Festuca*), and forbs, such as turkey mullein (*Eremocarpus setigerus*), yellow star thistle (*Centaurea solstitialis*), and black mustard (*Brassica nigra*).

Wildlife Habitat and Animals Present

Most animals were absent or dormant during this hot season. The following animals or their sign were detected during the survey: Black-tailed jackrabbit (*Lepus californicus*); scat of coyote (*Canis latrans*); San Diego alligator lizard (*Elgaria multicarinata*); fence lizards (*Sceloporus occidentalis*); grasshoppers (Orthoptera); wasps (Sphecidae); small rodent burrows (probably *Spermophilus* and/or *Thomomys*); crow (*Corvus brachyrhynchos*); and common songbirds. No special-status animal species were detected during these field surveys. No active nests were detected, although abandoned stick nests were present in the coast live oak canopy in the Willow Creek riparian corridor to the east of the survey areas.

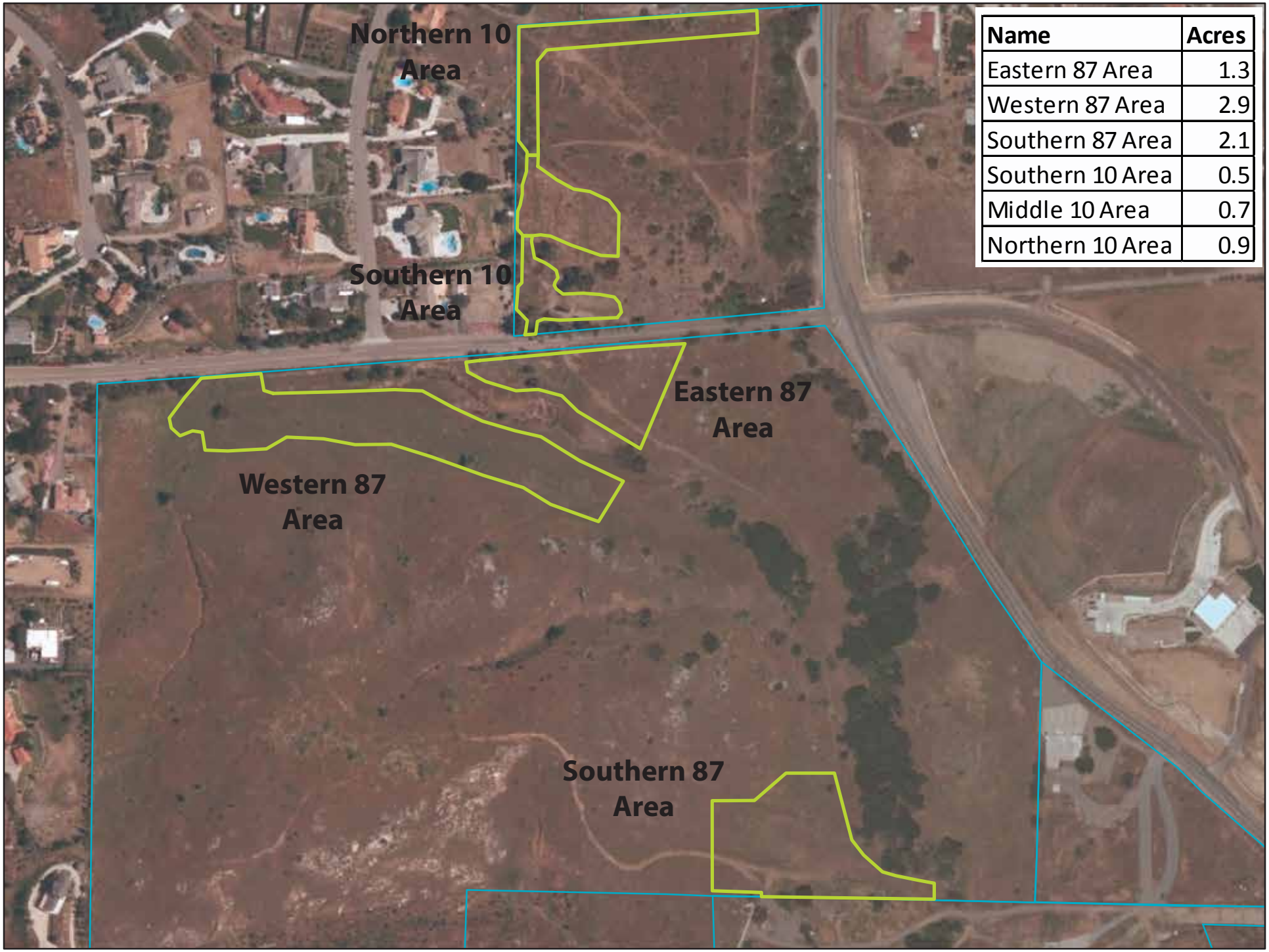
Conclusions and Recommendations

No federally-listed species or other special-status species were detected on any of the 5 potential parking areas. No special-status habitats exist in any of the 5 potential parking areas. No impacts to federally-listed species or critical habitat are expected from the proposed temporary uses. Of all 5 potential parking areas, the Southern 87-acre Parcel Parking Area has the least amount of native habitat value and the least potential for supporting special-status species (Exhibit 2; site photos).

FROM:

G. O. Graening, PhD, MSE

Exhibits and Site Photos



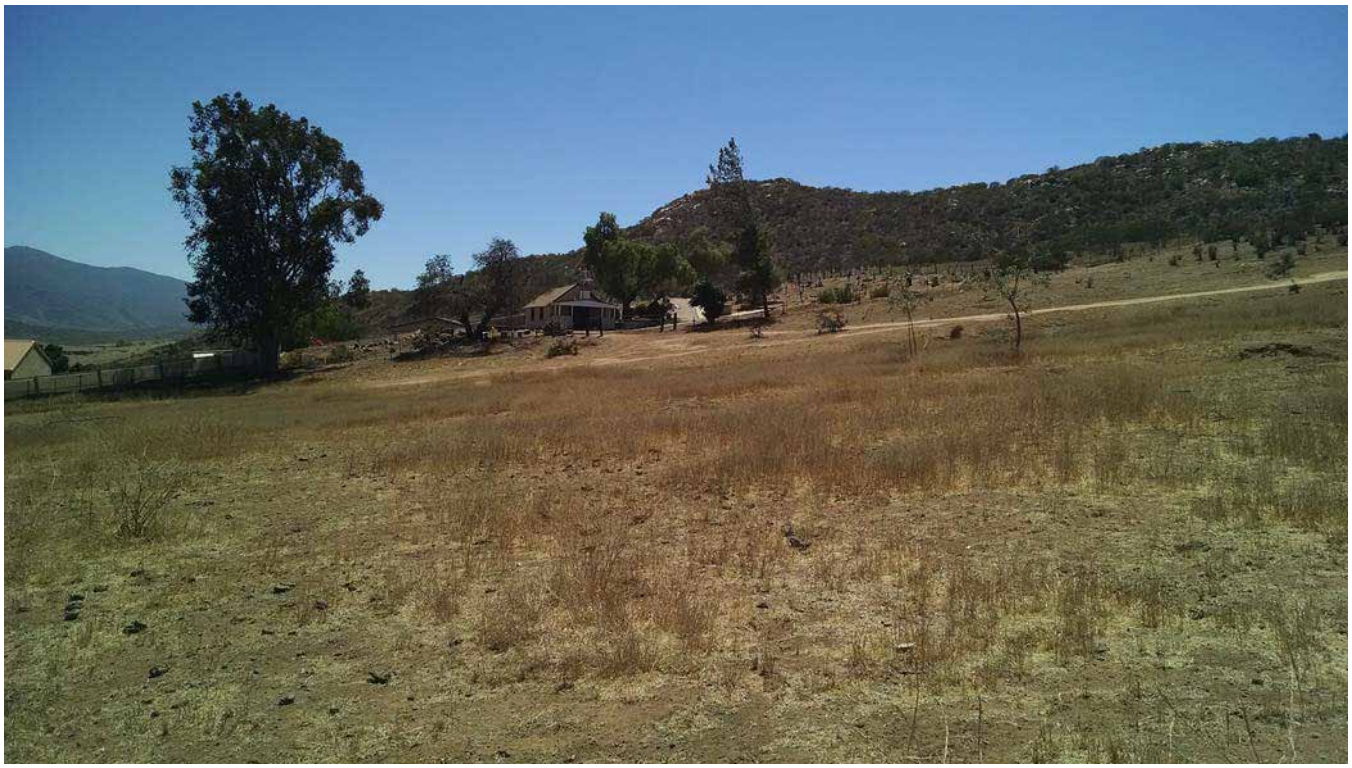
Name	Acres
Eastern 87 Area	1.3
Western 87 Area	2.9
Southern 87 Area	2.1
Southern 10 Area	0.5
Middle 10 Area	0.7
Northern 10 Area	0.9

Potential Parking Areas

Google earth

feet 300

meters 100



Site Photos of the Southern 87-acre Parcel Parking Area